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IDENTIFIERS *Automotive Tune Up

ABSTRACT

This task-based curriculum guide is intended to help secondary teachers provide relevant training for an entry-level job in auto mechanics. Introductory materials include background information on trade and industrial education and program goals and safety information. Descriptions follow of the construction trades program, vocational cooperative education, work experience/unpaid work experience, work experience and career exploration programs, and vocational work study. This job information is then provided: job titles and a task inventory for auto mechanics. Tasks are grouped under 21 duties in the following categories: practicing automotive safety; practicing shop-related skills; using employability skills; practicing Michigan Auto Repair Act; and certification in engine tune-up, electrical systems, brakes, front end and steering systems, engine repair, manual transmission--front and rear axles, automatic transmissions, heating and air conditioning, and cooling systems. Duty tabs comprise the largest portion of the curriculum guide. Each task in the listing is presented in a one-page format that provides this information: duty, task, achievement indicators, criteria, tools and equipment, and resources. Other components of the curriculum guide include tool and equipment lists, a student achievement record, a class achievement record, and a glossary of vocational terms. (YLB)

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* from the original document. *

MICHIGAN TRADE & INDUSTRIAL EDUCATION
CURRICULUM GUIDE

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INTRODUCTION

The Michigan Department of Education, Vocational-Technical Education Service, has adopted descriptions and codes for vocational-technical education programs found in the document entitled, "A Classification of Instructional Programs" (C.I.P.) National Center for Educational Statistics, February, 1981. This new coding system is required of all states in reporting data on all programs receiving funds under P.L. 94-482, the Vocational Education Amendments of 1976.

The current United States Office of Education (U.S.O.E.) coding system was discontinued at the conclusion of the 1981-82 school year. The 1982-83 school year is a transition year from the U.S.O.E. code system to the new C.I.P. Code system.

This Michigan Trade and Industrial Education Curriculum Guide uses the new C.I.P. program description code(s) and lists the entry level job titles associated with the occupational program area by the Dictionary of Occupational Titles (Fourth Edition, 1977), D.O.T. Code, and the Michigan Occupational Information System, (M.O.I.S.), Numerical Index code. NOTE: This information is located under Job Information with program description(s).

PROGRAM DEFINITIONS/GOALS

Vocational Education

The term "vocational education" means organized educational programs which are directly related to the preparation for paid or unpaid employment or for additional preparation for a career requiring other than a baccalaureate or advanced degree.¹

¹The Education Amendments of 1976, Section 195(1), Public Law 94-482.

Goals of Vocational-Technical Education

- (1) To provide persons with differing sex, age, racial/ethnic backgrounds, social-economic status, academic disadvantage, economic disadvantage, limited English speaking ability, physical and mental capabilities, and geographical location access to vocational-technical education training or retraining.
- (2) To coordinate pre-vocational exploration, career guidance, and placement programs so that each student may make informed and realistic occupational choices and have access to quality placement programs.
- (3) To provide all students with learning experiences which are realistic and sufficient in light of their occupational objective.
- (4) To insure that all vocational-technical programs will be planned, monitored, and evaluated in light of actual or anticipated employment opportunities and the demand by students for programs related to their abilities and occupational objectives.

Trade and Industrial Education

A vocational education curriculum that includes programs for manufacturing, construction, mechanical service, public service, health service, technical, and fisheries occupations, that prepares a person for entry level employment, upgrading or retraining in a semiskilled or skilled trade, semiprofessional or technical occupation, not generally classified as Agriculture, Distributive, Business or Office, in the Health profession, or Consumer/Home Economics in nature.

NOTE: The occupational clusters found within the scope of trade and industrial education include skilled or semiskilled trade, craft, or occupations which directly relate to the designing, producing, processing, assembling, maintaining, servicing, or repairing of any manufactured product.

TRADE AND INDUSTRIAL EDUCATION STUDENT ORGANIZATION

VICA

The Vocational Industrial Clubs of America (VICA) is the national organization serving trade, industrial, technical, and health occupations students in the United States. VICA incorporates leadership, citizenship, and character

development programs and activities into the skill training offered in America's schools and taught by men and women who have worked in the occupational areas in which they now instruct their students.

VICA emphasizes respect for the dignity of work, high standards in trade ethics, workmanship, scholarship, and safety. VICA promotes understanding of the free enterprise system and encourages development of patriotism through the practice of democracy within the club.

Competitive activities in the trade skills as well as areas such as public speaking, job interview, parliamentary procedure and safety are vital aspects of VICA's program.

TRADE AND INDUSTRIAL EDUCATION CURRICULUM GUIDE

This Michigan Trade and Industrial Education Curriculum Guide is the result of a project funded by the Michigan State Board of Education and the Michigan Department of Education, Vocational-Technical Education Service. The project is located at Michigan State University in the College of Agriculture and Natural Resources' Education Institute (ANREI) and is known as the Curriculum Resource Team.

The project is directed by Dr. Chris M. Olson and Ms. Carol E. Culpepper, Faculty Specialist, Curriculum Resource Team Coordinators. They were responsible for developing the curriculum format and working with a task force leader and committee of individuals from business, industry, and education to ensure the quality of the curriculum. The development of this curriculum was monitored by Melvin France, Secondary Trade and Industrial Education Supervisor.

The names of the occupational task force leader(s) committee members, secretaries, and other support staff are acknowledged after this Introduction.

The occupational program area(s) selected for curriculum development are based on a Vocational-Technical Education Service prioritized program

ranking based on employment demand, State average percent of placement, reimbursed enrollments, the number of programs, and entry level wages within the State of Michigan.

This curriculum guide was developed from the results of a statewide survey and job analysis of incumbent workers in the related occupational areas.

The curriculum guide is representative of the occupational job duty categories which list major activities and tasks performed on an entry level job. The curriculum guide contains a resource list and criteria statements which indicate the minimum standards of performance accepted as evidence of competence in completion of the task by business and industry. This is a task-based curriculum guide which helps a teacher develop a classroom management system where students learn by doing. It is based on task analysis and reflects the skills, knowledge, and attitudes that employers expect incumbent workers to possess.

The curriculum is linked to the labor market, helps the instructor open communication channels with business and industry, and manage classroom instruction where students learn "Need-to-Know" instead of "Nice-to-Know" facts.

This curriculum is adaptable for special needs/handicapped students, helps to validate the program, prepares students for entry level jobs and helps students to make career choices related to job placement.

It is the intent by all those involved in the development of this curriculum guide that it be used to provide relevant training or retraining for employment in the world of work.

The secondary occupational programs/courses in Michigan should meet the following minimum standards to assure soundness and quality of instruction:

- (1) The program of instruction must be based on a consideration of the skills and knowledge required in the occupation for which the

instruction is being provided, and includes a planned logical sequence for those essentials of education or experience deemed necessary for the individual to meet an occupational objective.

- (2) The program of instruction must be developed and conducted in consultation with a Local Advisory Council/Committee which has an appropriate representation of both sexes and an appropriate representation of racial and ethnic minorities found in the program area, school, and community origin. The local advisory council will advise on current job needs, relevance of programs, and courses in meeting current job needs and consult with the local educational agency in developing program application.
- (3) The program of instruction will include the most up-to-date curriculum based on the competencies required in the occupation or occupational field in which the individual is being prepared, upgraded, or updated.
- (4) The program of instruction will be sufficiently extensive in duration and intensive within a schedule unit of time to enable the student to develop the necessary knowledge, attitudes, and skills necessary for employment in the occupation or occupational field.
- (5) The program of instruction will combine and coordinate related instruction with field, shop, laboratory, cooperative work, or other occupational experience which is appropriate to the vocational objective of the student, is of sufficient duration to develop competencies necessary for employment in the occupation or occupational field, and supervised, directed, or coordinated by a person qualified under the State Plan.

Facilities, equipment, and instructional materials:

- (1) Classrooms, libraries, shops, laboratories, and other facilities, including instructional equipment, supplies, teaching aids, and other materials will be adequate in supply and quality to meet the standards approved by the State Board so that such facilities are adequate to enable those who are to be trained to meet the occupational objective for which the education is intended.
- (2) If the State Board or local educational agency cannot provide adequate facilities and materials, and such are available in a business or industrial establishment, funds may be used to reimburse the local public educational agency for training programs conducted in private industry when it complies with the training standards and regulations established by the State Board. Such instruction shall be under the supervision and administration of a local public educational agency.

ACKNOWLEDGEMENT

The Michigan Trade and Industrial Curriculum Guide(s) were developed through a series of workshops held throughout the State and at Michigan State University during the 1982-83 school year.

Appreciation is given to all who have contributed their thoughts, time and energy to this curriculum project.

The Michigan Department of Education, Vocational-Technical Education Service, is indebted to the following individuals who were instrumental in the completion of this project and the development of the materials:

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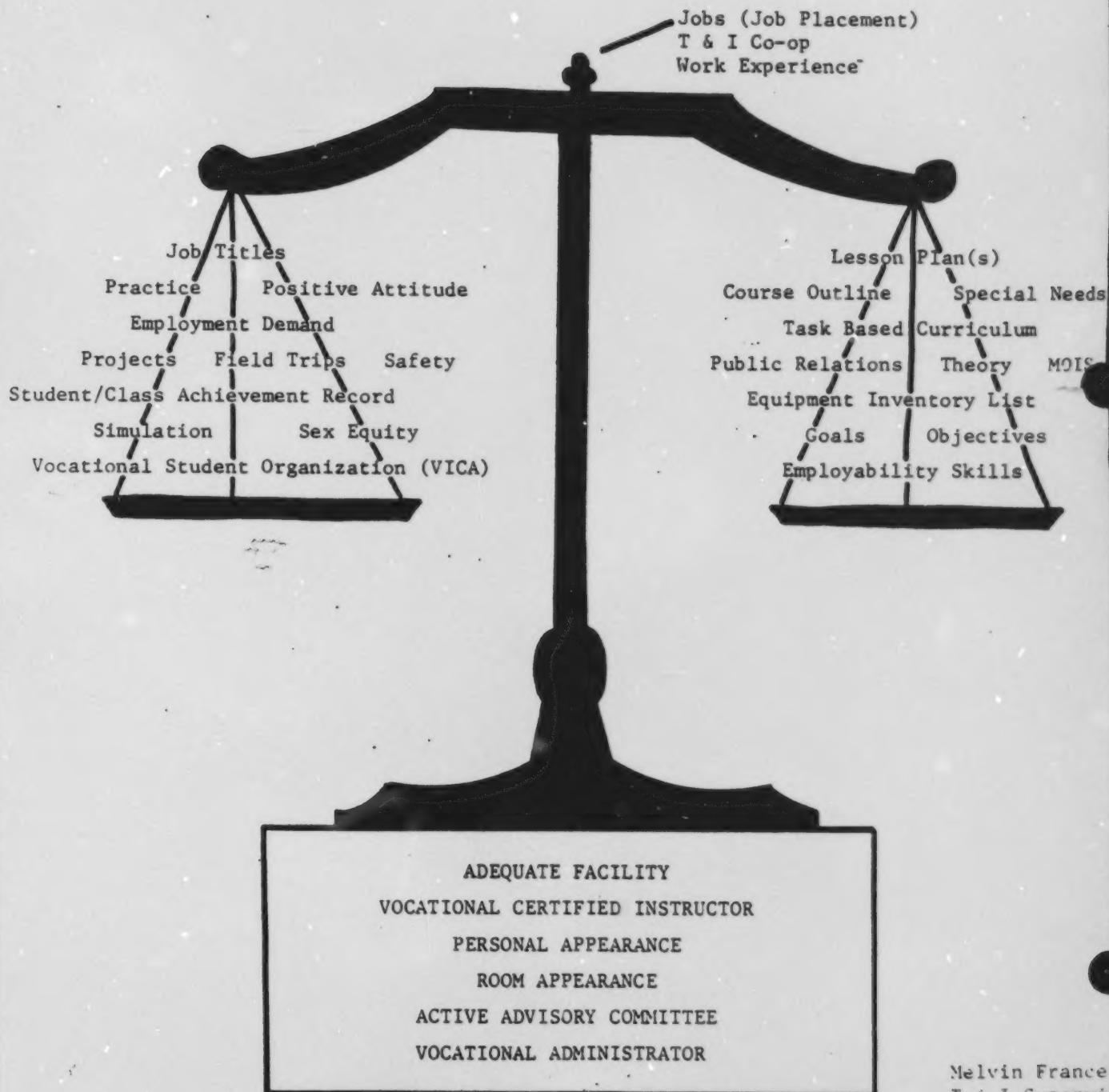
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MICHIGAN TRADE AND INDUSTRIAL EDUCATION

IS YOURS A BALANCED PROGRAM?



DEPARTMENT OF EDUCATION
STATE BOARD OF EDUCATION

EYE PROTECTIVE DEVICES

Filed with Secretary of State,

These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the state board of education by section 585a of Act No. 269 of the Public Acts of 1955, as added, being section 340.585a of the Compiled Laws of 1948.)

R 340.1301. Definitions.

Rule 1. As used in these rules:

(a) "Caustic" or "acid" means a material, exclusive of hot water or steam, capable of destroying, eroding or burning of flesh by chemical action.

(b) "Explosive material" means a substance capable of a large-scale, rapid and spectacular expansion which will propel materials in a manner causing injury to the human body.

(c) "Hot liquid" or "solid" means a material having effects that are physically harmful to the eyes.

(d) "Sanitizing" means the disinfecting and cleaning of eye protective devices before use.

(e) "When exposure to eye danger exists" means the exposure when a person is within that distance from sparks, flying particles, rays, molten metal, fumes, glare, glass breakage or chemical splash that such an object or condition could cause damage to his eyes, if he was not using a protective device.

R 340.1302. Educational courses requiring eye protection.

Rule 2. A public educational agency which enrolls students in the following courses when exposure to eye danger exists, shall furnish eye protective devices: vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicles; caustic or explosive materials; or chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

R 340.1303. Standards for devices.

Rule 3. (1) An eye protective device shall meet the following standards based upon the operation involved:

(a) Acetylene burning, acetylene cutting, and acetylene welding operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of sparks, harmful rays, molten metal and flying particles.

(b) Chemical handling operations - goggles of flexible fitting with hooded ventilation or face shield with plastic or mesh window. This protects against the primary hazards of splash, acid burns and fumes.

(c) Chipping operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses. This protects against the primary hazard of flying particles.

(d) Electric (arc) welding operations - welding goggles of coverspec type with tinted plate lenses or welding helmets or welding helmet in combination with tinted lens spectacles. This protects against the primary hazards of sparks, intense rays and molten metal.

(e) Furnace operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of glare, heat and molten metal.

(f) Light grinding, machining, and spot welding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or face shield with plastic or mesh window. This protects against the primary hazards of flying particles and sparks.

(g) Heavy grinding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses or in case of severe exposure add face shield with plastic or mesh window. This protects against the primary hazard of flying particles.

(h) Laboratory operations - goggles of flexible fitting with hooded ventilation or face shield in combination with metal or plastic frame spectacles with sideshields. This protects against the primary hazards of chemical splash and glass breakage.

(i) Molten metal operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or face shield in combination with metal or plastic frame spectacles with sideshields and tinted lenses. This protects against the primary hazards of heat, glare, sparks and splash.

(2) The standards described in subrule (1) are taken from the American National Standards Safety Code Z87.1-1968, figure 8, page 28, which is available from the American National Standards Institute, Incorporated, 1430 Broadway, New York, New York 10018, at a cost of \$5.00. Applicable excerpts from the American National Standards Safety Code are available at no cost from the Michigan department of education, Lansing, Michigan.

R 340.1304. Sanitization of devices.

Rule 4. An eye protective device shall be sanitized when 2 or more students use the same device, by either:

(a) Washing after each use in warm water and soap or detergent, followed by a rinse in running water.

(b) Placing in a cabinet with ultraviolet light and washing once a week as in subdivision (a).

R 340.1305. Compliance.

Rule 5. (1) A superintendent of a school district shall certify to the intermediate school district superintendent not later than the second week of each school year, on forms prescribed by the Michigan department of education, that eye protective devices meeting the standards of these rules have been obtained. For the school year 1972-73, certification shall be made within 4 weeks after the effective date of these rules. This certification shall also indicate that instructors have been informed that all students, teachers and visitors shall wear the devices when exposure to eye damage exists, as identified in these rules.

(2) An intermediate school district superintendent shall report to the state superintendent of public instruction by October 1 the names of those constituent school districts which are not in compliance with these rules. For the school year 1972-73, the report shall be made within 6 weeks after the effective date of these rules.

(3) The state superintendent of public instruction shall notify a school district in violation of these rules that it shall comply or show cause why compliance cannot be made within 30 days.

ACT NO. 54 OF THE PUBLIC ACTS OF 1972

ENROLLED SENATE BILL NO. 553

AN ACT to amend Act No. 269 of the Public Acts of 1955, entitled "The Michigan School Code", and to repeal certain acts and parts of acts, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, by adding section 585a.

The People of the State of Michigan enact:

Section 1. Act No. 269 of the Public Acts of 1955, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, is amended by adding section 585a to read as follows:

Sec. 585a. (1) Every pupil and teacher participating in a course mentioned in this section shall wear industrial quality eye protective devices, which have been sanitized prior to use, when exposure to danger exists while participating in such course. The board of education shall furnish the devices for pupils, teachers and visitors to the classrooms or laboratories. The courses for which protective devices are required are:

(a) Vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicle; or caustic or explosive materials.

(b) Chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

(2) "Industrial quality eye protective devices" means devices meeting the standards of the American standard safety code for head, eye and respiratory protection, Z87.1-1968, promulgated by the American standards association, incorporated.

(3) The provisions of this section shall be enforced pursuant to rules promulgated by the state board of education in accordance with and subject to Act No. 306 of the Public Acts of 1969, as amended, being sections 24.201 to 24.315 of the Compiled Laws of 1948.

Section 2. This amendatory act shall take effect September 1, 1972.

The following adapted from the:

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST

Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION—NATIONAL SAFETY COUNCIL

Date _____

INTRODUCTION

A safe environment is an essential part of the school shop safety education program. The safe environment will exist only if hazards are discovered and corrected through regular and frequent inspections by school personnel—administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some

communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students—the student safety engineer and/or student safety committee—participate in making regular inspections.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may

This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in

accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

- S — Satisfactory (needs no attention)
- A — Acceptable (needs some attention)
- U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code

number applicable (as B-3).

In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

- | | | | |
|---|-------|--|-------|
| 1. Machines, benches, and other equipment are arranged so as to conform to good safety practices..... | S A U | 12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies | S A U |
| 2. Condition of stairways..... | S A U | 13. Lockers are inspected regularly for cleanliness and fire hazards. | S A U |
| 3. Condition of aisles..... | S A U | 14. Locker doors are kept closed..... | S A U |
| 4. Condition of floors..... | S A U | 15. Walls are clear of objects that might fall..... | S A U |
| 5. Condition of walls, windows, and ceiling..... | S A U | 16. Utility lines are properly identified..... | S A U |
| 6. Illumination is safe, sufficient, and well placed..... | S A U | 17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building. | S A U |
| 7. Ventilation is adequate and proper for conditions..... | S A U | 18. Air in shop is free from excessive dust, smoke, etc.... | S A U |
| 8. Temperature control..... | S A U | 19. _____ | S A U |
| 9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained..... | S A U | 20. _____ | S A U |
| 10. Teacher and pupils know location of and how to use proper type for various fires..... | S A U | 21. _____ | S A U |
| 11. Number and location of exits is adequate and properly identified | S A U | 22. _____ | S A U |
| | | 23. Evaluation for the total rating of A. GENERAL PHYSICAL CONDITION | S A U |

B. HOUSEKEEPING

1. General appearance as to orderliness..... S A U
2. Adequate and proper storage space for tools and materials..... S A U
3. Benches are kept orderly..... S A U
4. Covers are clean and clear..... S A U
5. Special tool racks, in orderly condition, and provided at benches and machines..... S A U
6. Tool, supply, and/or material room is orderly..... S A U
7. Sufficient scrap boxes are provided..... S A U
8. Scrap stock is put in scrap boxes promptly..... S A U
9. Materials are stored in an orderly and safe condition... S A U
10. A spring lid metal container is provided for waste and oily rags..... S A U
11. All waste materials and oily rags are promptly placed in the containers..... S A U
12. Containers for oily rags and waste materials are frequently and regularly emptied..... S A U
13. Dangerous materials are stored in locked cabinets..... S A U
14. Machines have been color conditioned..... S A U
15. Safety cans are provided for flammable liquids..... S A U
16. Bulk storage of dangerous materials is provided outside of the main building..... S A U
17. A toe-board or railing around a mezzanine used for storage or washing facilities..... S A U
18. Materials are stored in an orderly and safe condition on this mezzanine..... S A U
19. Flammable liquids are not used for cleaning purposes S A U
20. Floors are free of oil, water and foreign material..... S A U
21. Floors, walls, windows, and ceilings are cleaned periodically..... S A U
22. _____ S A U
23. _____ S A U
24. _____ S A U
25. _____ S A U
26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc..... S A U
2. Danger zones are properly indicated and guarded..... S A U
3. All gears, moving belts, etc., are protected by permanent enclosure guards..... S A U
4. All guards are used as much as possible..... S A U

C. EQUIPMENT (continued)

5. All equipment control switches are easily available to operator S A U
6. All machines are "locked off" when instructor is out of the room S A
7. Brushes are used for cleaning equipment..... S A U
8. Nonacid areas are provided around machines..... S A U
9. Machines are in safe working condition..... S A U
10. Machines are guarded to comply with American Standards Association and local state code..... S A U
11. Adequate supervision is maintained when students are using machines and dangerous tools..... S A U
12. Tools are kept sharp, clean and in safe working order S A U
13. All hoisting devices are in safe operating condition... S A U
14. Machines are shut off while unattended..... S A U
15. Adequate storage facilities for tools, equipment, etc., not in immediate use..... S A U
16. _____ S A U
17. _____ S A U
18. _____ S A U
19. _____ S A U
20. Evaluation for the total rating for C. EQUIPMENT... S A U

D. ELECTRICAL INSTALLATION

1. All switches are enclosed..... S A U
2. There is a master control switch for all of the electrical installations..... S A U
3. Electrical outlets and circuits are properly identified... S A U
4. All electrical extension cords are in safe condition and are not carrying excessive loads..... S A U
5. All machine switches are within easy reach of the operators..... S A U
6. Electrical motors and equipment are wired to comply with the National Electric Code..... S A U
7. Individual cut-off switches are provided for each machine..... S A U
8. Machines are provided with overload and underload controls by magnetic pushbutton controls..... S A U
9. No temporary wiring in evidence..... S A U
10. _____ S A U
11. _____ S A U
12. _____ S A
13. _____ S A U
14. Evaluation for the total rating for D. ELECTRICAL INSTALLATION..... S A U

E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high..... S A U
2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls, or other flammable materials S A U
3. No gas hose is used where pipe connections could be made. S A U
4. Gas appliances have been adjusted so that they may be lighted without undue hazard..... S A U
5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas..... S A U
6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop..... S A U
7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure.. S A U
8. When lighting the gas forge, goggles are worn..... S A U
9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace..... S A U
10. In shutting down the gas furnace, the gas valve is closed before the air valve..... S A U
11. _____ S A U
12. _____ S A U
13. _____ S A U
14. _____ S A U
5. Evaluation for the total rating for E. GAS..... S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist..... S A U
2. If individual goggles are not provided, hoods and goggles are properly disinfected before use..... S A U
3. Shields and goggles are provided for electric welding.. S A U
4. Rings and other jewelry are removed by pupils when working in the shop..... S A U
5. Proper kind of wearing apparel is worn and worn properly for the job being done..... S A U
6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed..... S A U
7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room..... S A U
8. Provisions are made for cleaning and sterilizing respirators. S A U
9. Students are examined for safety knowledge ability.. S A U
10. Sleeves are rolled above elbows when operating machines. S A U
11. Clothing of students is free from loose sleeves, flapping ties, loose coats, etc. S A U
12. _____ S A U

F. PERSONAL PROTECTION (continued)

13. _____ S A U
14. _____ S A U
15. _____ S A U
16. Evaluation for the total rating for F. PERSONAL PROTECTION. S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit. S A U
2. Safety rules are posted particularly at each danger station. S A U
3. Printed safety rules are given each student..... S A U
4. Pupils take a safety pledge..... S A U
5. Use of a safety inspector..... S A U
6. Use of a student shop safety committee..... S A U
7. Use of safety contests..... S A U
8. Motion and/or slide films on safety are used in the instruction. S A U
9. Use of suggestion box..... S A U
10. Use of safety tests..... S A U
11. Use of safety posters..... S A U
12. Talks on safety are given to the classes by industrial men. S A U
13. Tours are taken of industrial plants as a means of studying safety practices S A U
14. Periodic safety inspections of the shop are made by a student committee S A U
15. Men from industry make safety inspections of the shop S A U
16. Student shop safety committee investigates all accidents S A U
17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on tests given in this area S A U
18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate... S A U
19. _____ S A U
20. _____ S A U
21. _____ S A U
22. _____ S A U
23. Evaluation for the total rating of G. INSTRUCTION S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt..... S A U
2. Adequate accident statistics are kept..... S A U
3. Accidents are reported to the proper administrative authority by the instructor S A U

4. A copy of each accident report is filed with the State Department of Education S A U

5. Accident reports are analyzed for instructional purposes and to furnish the basis for elimination of hazards..... S A U

6. _____ S A U

7. _____ S A U

8. _____ S A U

9. _____ S A U

10. Evaluation for the total rating of H. ACCIDENT RECORDS. S A U

1.	An adequately stocked first aid cabinet is provided...	3	A
2.	The first aid is administered by a qualified individual	3	A
3.	The school has individuals qualified to administer first aid.	3	A
4.	_____	3	A
5.	_____	3	A
6.	_____	3	A
7.	_____	3	A
8.	Evaluation for the total rating of I. FIRST AID....	3	A

[illegible]

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Stock No 429

C.I.P. PROGRAM DESCRIPTION

47.0604 Automotive Mechanics

An approved instructional program that prepares individuals to engage in the servicing, maintenance, adjustment, and repair of automotive components and systems. This program provides a sequence of learning experiences related to Michigan repair categories requiring certification, engine repair, engine tune up, front end and steering systems, brakes and braking systems, automatic transmission, manual transmission, front and rear axles, electrical systems, and heating and air conditioning.

Learning activities in the classroom, laboratory, shop and actual work setting are combined to provide students with the opportunity to become knowledgeable of nomenclature, safety principles and practices and job entry level skills in dis-assembling, assembling, inspecting, repairing, and replacing components or systems.

VOCATIONAL COOPERATIVE EDUCATION

Definition

"The term 'cooperative education' means a program of vocational education for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related vocational instruction by alternation of study in school with a job in any occupational field, but these two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and to his or her employability. Work periods and school attendance may be on alternate half days, full days, weeks, or other periods of time in fulfilling the cooperative program." (P.L. 94-482)

Responsibilities of School District

The local school district must meet all the Federal requirements of P.L. 94-482, Section 122; 45 CFR 104.511 through 104.533 and the State of Michigan Statutes and General School Laws listed below:

A. IT IS A PROGRAM OF VOCATIONAL EDUCATION.

"Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

B. THERE IS A WRITTEN AGREEMENT BETWEEN THE SCHOOL AND EMPLOYERS.

The Youth Employment Standards Act (P.A. 90 of 1978) governs the legal employment of minors in Michigan. In section 18 of the Act, a provision is made to allow a written agreement, or contract, to be entered into between an employer and the board of education of the school district, in which the minor is enrolled. This written agreement exempts a student from obtaining a work permit and allows the student to be legally employed in Michigan. The employment, however, shall not be in violation of a Federal Statute or regulation and a signed copy of the agreement shall be on file in the place of employment before a minor begins employment. The training agreement, in cooperative education, is the legal written agreement developed cooperatively between the employer, teacher-coordinator, student, and parent and outlines the responsibilities of the employer and student to the program and establishes the legal conditions of the student-learner's employment.

C. THERE IS INSTRUCTION (INCLUDING REQUIRED ACADEMIC INSTRUCTION) IN SCHOOL RELATED TO THE JOB IN ANY OCCUPATIONAL AREA.

The program is of sufficient duration to develop competencies necessary to prepare the learner for employment. It provides a coordinated instructional program combining supervised part-time employment and

classroom instruction related to the learner's job. Related vocational instruction for cooperative education enrollees shall be scheduled weekly.

- D. THE ALTERNATION OF STUDY AND WORK ARE PLANNED AND SUPERVISED BY THE SCHOOL AND EMPLOYER IN ORDER TO FURTHER THE STUDENT'S EDUCATION AND EMPLOYABILITY.

The student-learner shall be employed for an average of not less than 15 hours per week during the effective time of the individual's program. The school shall have the responsibility of providing coordination and supervision services during such time.

- E. STUDENTS ARE EMPLOYED AND COMPENSATED IN CONFORMITY WITH FEDERAL, STATE AND LOCAL LAWS.

The program provides cooperative on-the-job training that (1) employs and compensates student-learners in conformity with Federal, State, and local laws and regulations and in a manner not resulting in exploitation of the student-learner for private gain, and (2) is conducted in accordance with written training agreements between local education agencies and employers.

References

Individuals requiring additional information pertaining to cooperative education principles and practices are asked to consult the Michigan Department of Education, Vocational-Technical Education Service, developed Cooperative Education Handbook available in September of 1981.

WORK EXPERIENCE

PAID WORK EXPERIENCE

Definition

Paid work experience programs are school-sponsored and supervised employment programs. Students are allowed to earn academic credit while employed in the community. The employment serves as a means of acquiring desirable work habits and attitudes towards the world of work. The employment is not necessarily related to a student's career interest and enrollment in a related vocational education program is not required.

Objectives

Paid work experience programs are designed to provide students an opportunity to:

1. Foster positive attitudes about work, school and society
2. Promote an understanding in the dignity of work
3. Develop a student's ability to understand and function in an employer-employee relationship
4. Earn wages to remain in school
5. Experience an alternative to the traditional school program

Guidelines

1. Written work agreements should be completed between the employer, student, parent and school
2. Written work agreements should be completed in conformance to all Federal, State and local laws, rules and regulations; including non-discrimination against any student because of race, color, sex, national origin or ancestry. This policy of non-discrimination shall also apply to otherwise qualified handicapped individuals
3. Related academic instruction, where possible, should be provided
4. A school work experience coordinator should be provided to serve as a liaison between the student, employee, parents and school officials
5. Academic credit should be awarded for participation in the program

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund paid work experience programs.

UNPAID WORK EXPERIENCE

Definition

Unpaid work experience is a school sponsored and supervised instructional technique used in vocational education programs in which students are placed with an employer for a limited time and are not compensated during the duration of the experience.

Objectives

Unpaid work experience programs are designed to provide students with an opportunity to:

1. Receive on-site exposure to various businesses and industries while participating in a related vocational education program
2. Develop a realistic understanding of the relationship between education and the world of work
3. Enhance a positive self-image
4. Assist in the selection of occupational choices
5. Expand learning opportunities by using community resources

Guidelines

1. The training, even though it includes actual operation of the facilities of the participating employer is similar to that given in a vocational school
2. The training is for the benefit of the trainee
3. The trainee does not displace a regular employee, but does work under a regular employee's close observation
4. The participating employer does not derive an immediate advantage from the activities of the trainee
5. The trainee is not necessarily entitled to a job at the conclusion of the training period
6. The trainee is not entitled to wages for the time spent in the training
7. The training is for not more than 45 hours with a participating employer during each school semester
8. The training is conducted under a written work experience training agreement between the school district and the participating employer

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund unpaid work experience but considers it to be an allowable instructional activity under a given vocational education program.

WORK EXPERIENCE AND CAREER EXPLORATION PROGRAM
(W.E.C.E.P.)

I. Definition

The Work Experience and Career Exploration Program (W.E.C.E.P.) is a school-supervised and administered program that includes part-time work as an integral part of an educational program aimed at motivating 14 and 15 year-old youth toward education and preparing them for the world of work.

II. Program Objectives

There are several objectives of a W.E.C.E.P. program:

- A. To provide a career-oriented educational program for dropout prone youth to become oriented and motivated toward education and the world of work.
- B. To increase the desire to learn and improve educational performance.
- C. To develop a greater degree of self-confidence, responsibility and aid in the maturation process of the student participants.
- D. To provide student participants with on-the-job learning experiences that are in harmony with their interests, needs and objectives.
- E. To improve school adjustment of student participants for whom the traditional curriculum is found to be inadequate.
- F. To promote personal and social adjustment of the student participants and establish emotional stability through a feeling of being engaged in worthwhile activity.

III. Instructional Content

W.E.C.E.P. programs are planned so as to include part-time work supervised by employers and school personnel, as an integrated part of the enrollee's educational program. Students receive work experience on jobs permitted or approved under Federal or State laws. Students are in class with a W.E.C.E.P. teacher-coordinator for job-related and occupational safety, including needed individualized or remedial instruction. Students also receive a minimum of 20 hours of instruction on the Michigan Occupational Information System (MOIS) and a minimum of 30 hours of employability skills instruction. The students' employment is under the supervision of W.E.C.E.P. teacher-coordinators and employers. Students receive all State required courses necessary for graduation. The W.E.C.E.P. program is planned so that the students' individual academic achievement potential is recognized.

IV. Program Organization

The Vocational-Technical Education Service, Michigan Department of Education requires that W.E.C.E.P. programs in local districts meet the following criteria:

- A. Eligibility. Any student aged 14 or 15 years, whom authoritative local school personnel identify as being able to benefit from the program, shall be eligible to participate.
- B. Credits. Students shall receive school credits for both in-school related instruction and on-the-job experience.
- C. Size. Each program unit shall consist of 12 to 25 students to one W.E.C.E.P. teacher-coordinator.
- D. Instructional Schedule. W.E.C.E.P. students will spend a minimum of four periods daily in classroom instruction including one period of 180 hours of instruction devoted to job-related and employability skill instruction, safety and career exploration. Each student will have a minimum of 20 hours of career exploration utilizing the Michigan Occupational Information System (MOIS) and have a minimum of 30 hours of instruction in employability skills training. The employability skills training will equal or exceed the employability skills performance objectives adopted, as part of Michigan Vocational-Technical Service programs. Each local district submitting a letter of application to operate a W.E.C.E.P. program will furnish to the Vocational-Technical Education Service a course outline for the related class.
- E. W.E.C.E.P. Teacher-Coordinator. Each program unit shall be under the supervision of a school official to be designated for the purpose of the program as a W.E.C.E.P. teacher-coordinator, who shall generally supervise the program and coordinate the work and education aspects of the program and make regularly scheduled visits to the work stations.
- F. Written W.E.C.E.P. Training Agreement. No student shall participate in the program until there has been made a written W.E.C.E.P. training agreement signed by the W.E.C.E.P. teacher-coordinator, the employer and the student. The agreement shall also be signed or otherwise consented to by the student's parent or guardian. The W.E.C.E.P. training agreement will detail job tasks and related in-school instruction. A sample W.E.C.E.P. training agreement will be submitted annually by the local district to the Vocational-Technical Education Service.
- G. Provision for Health and Well-Being. Employment under W.E.C.E.P. will not interfere with the schooling of the minors or with their health and well-being.

H. Records and Reports. The names and addresses of each school and the names and addresses of each employer enrolling work experience and career exploration program students and the number of enrollees in each unit shall be kept at the Vocational-Technical Education Service's office. A copy of the written W.E.C.E.P. training agreement for each student participating in the program shall be kept in the local educational office. The records required (for this paragraph) shall be kept for a period of three years from the date of enrollment in the program and shall be made available for inspection or transcription to the representatives of the Administrator of the Wage and Hour Division. Each school district operating a W.E.C.E.P. program shall submit an annual evaluative report by June 30th, which details the results of the W.E.C.E.P. program in terms of attendance and tardiness patterns, grade point average trends and dropout statistics of the enrollees. Based on a favorable state agency evaluation, a local district will be approved on an annual basis to operate a W.E.C.E.P. program. Under no circumstances can a local district operate a W.E.C.E.P. program without first obtaining written state agency approval for the program.

I. Approved Occupations. Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be permitted in all occupations except the following:

1. Manufacturing and mining.
2. Occupations declared to be hazardous for the employment of minors between 16 and 18 years of age in Subpart E of Part 570 Child Labor Regulations, Orders and Statements of Interpretation of the Federal Fair Labor Standards Act, and occupations in agriculture declared to be hazardous for employment of minors below the age of 16 in Subpart E-1 of this part.
3. Occupations other than those permitted under sections 570.33 and 570.34 except upon approval of a variation in individual cases or classes of cases by the Administrator of the Wage and Hour Division after notice to interested persons and opportunity to be heard.

Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be confined to not more than 23 hours in any week when school is in session and not more than three hours in any day when school is in session, any portion of which may be during school hours.

Employment of W.E.C.E.P. participants must not have the effect of displacing a worker in the establishment of the employer. Participants in W.E.C.E.P. must be paid according to the statutory minimum wage provision of the Fair Labor Standards Act.

V. Approval of Local Programs

Local school districts desiring approval to operate a W.E.C.E.P. program must submit an annual letter of application by June 30th to the

Michigan Department of Education
Vocational-Technical Education Service
Secondary Unit
Box 30009
Lansing, MI 48909
(517) 373-3365

VOCATIONAL WORK-STUDY

Definition and Purpose

The vocational work-study program is for those students who are in need of earnings from employment in order to commence or continue their vocational education programs.

Administration

The work-study program shall be administered by local educational agencies and made available, to the extent of available funds, to all qualified youth, in the area served by such agencies, who meet requirements.

Eligible Students

Employment under the work-study program shall be furnished only to a student who (a) has been accepted for enrollment or, if already enrolled, is in good standing and in full time attendance as a full-time student in a vocational education program which meets the standards of the state board and of the local educational agency and the requirements of the state plan, (b) is in need of the earnings from such employment to commence or continue a vocational education program, and (c) is at least 15 years of age and less than 21 years of age at the date of commencement of employment and is capable in the opinion of the appropriate school authorities of maintaining good standing in a school program while employed under the work-study program.

Limitation of Hours and Compensation of Employment

No student shall be employed under a vocational work-study program for more than 20 hours in any week in which classes in which the student is enrolled are in session. Summer employment shall not exceed 40 hours per week.

Employers

Employment under work-study programs shall be for the local educational agency or for some other public agency or institution, federal, state, or local and work so performed shall be adequately supervised and coordinated and shall not supplant present employees of such agency or institution who ordinarily perform such work. In those instances where employment under work-study programs is for a federal agency or institution, the written arrangement between the local educational agency and the federal agency or institution shall state that students so employed are not federal employees for any purpose.

Amounts Spent for Employment

In each fiscal year during which the work-study program remains in effect, the local educational agency shall expend for employment of its students an amount in state and/or local funds that is not less than the average annual expenditure for work-study programs of a similar nature during the three fiscal years preceding in which the supplementary plan provisions for its work study program are approved.

Applications, Priorities, and Approval

Work-study programs shall be approved on an individual basis by the state board and shall be consistent with the policies and procedures set forth.

Applications by Local Educational Agencies

Local educational agencies shall submit project proposals to the state board staff for approval in a manner similar to other vocational education programs.

Priority of Projects

Work-study programs will be provided, insofar as financial resources are available, for the undertaking of such programs in the order determined by the application of criteria for determining relative priority of projects which shall include preference for local educational agencies serving communities having substantial numbers of dropouts and unemployed youths and may include other relevant factors such as the extent to which the local educational agencies are using guidance and counseling and other related services designed to achieve the purposes of the work-study program.

AUTO MECHANICS
JOB TITLES

<u>D.O.T.</u>	<u>JOB TITLE</u>
620.281-066	Tune-Up Mechanic (and Helper)
825.281-022	Ignition and Carburetor Mechanic
620.281-014	Emission Mechanic
620.281-034	Carburetor Mechanic
620.281-010	Auto Air Conditioner Services
620.381-010	Auto Radiator Mechanic
825.281-022	Automotive Electrician
825.684-010	Automotive Electrician Helper
721.281-010	Auto Generator, Alternator and Starter Repairer
620.281-038	Front End Mechanic
620.281-026	Brake Repairer
620.261-010	Automotive Mechanic
625.281-010	Diesel Engine Mechanic, Auto
620.281-062	Transmission Mechanic
620.684-022	Clutch Rebuilder
620.261-010	Differential Repairer
807.664-010	Muffler Installer

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TASK LIST FOR
AUTO MECHANICS

A. PRACTICING AUTOMOTIVE SAFETY

1. Review personal safety rules to become aware of personal safety rules while performing in the automotive lab.
2. Review safety rules for handling flammables to become aware of potential hazards while handling flammables in the automotive lab.
3. Review safety rules for handling chemicals to become aware of potential hazards while handling chemicals in the automotive lab.
4. Review rules for proper ventilation to become aware of potential hazards from the lack of proper ventilation in the automotive lab.
5. Review safety rules on vehicle operation to become aware of the potential hazards while driving a vehicle in the automotive lab.
6. Review safety rules for ignition system service to become aware of potential hazards while working on a vehicle.
7. Review safety rules for fuel system service to become aware of potential hazards while working on a vehicle.
8. Review safety rules for emission control system service to become aware of potential hazards while working on a vehicle.
9. Review safety rules for servicing electrical systems to become aware of potential hazards while working on a vehicle.
10. Review safety rules for servicing electrical accessories to become aware of potential hazards while working on a vehicle.
11. Review safety rules for servicing the braking system to become aware of potential hazards while working on a vehicle.
12. Review safety rules for servicing the steering system to become aware of potential hazards while working on a vehicle.
13. Review safety rules for servicing the suspension system to become aware of potential hazards while working on a vehicle.
14. Review safety rules while diagnosing the engine to become aware of potential hazards while working on a vehicle.
15. Review safety rules for servicing the engine block to become aware of potential hazards while working on a vehicle.

A. PRACTICING AUTOMOTIVE SAFETY (continued)

16. Review safety rules for servicing the cylinder head to become aware of potential hazards while working on a vehicle.
17. Review safety rules for servicing the exhaust system to become aware of potential hazards while working on a vehicle.
18. Review safety rules for servicing manual transmission to become aware of potential hazards while working on a vehicle.
19. Review safety rules for servicing drive-lines to become aware of potential hazards while working on a vehicle.
20. Review safety rules for servicing the automatic transmission to become aware of potential hazards while working on a vehicle.
21. Review safety rules for heating and air conditioning to become aware of potential hazards while working on a vehicle.
22. Review safety rules for servicing the cooling system to become aware of potential hazards while working on a vehicle.
23. Learn safety rules on general shop safety to become aware of potential hazards while working in the automotive lab.
24. Conduct individual student shop safety inspection to become aware of potential hazards that may exist in the automotive lab.

B. PRACTICING SHOP RELATED SKILLS

1. Raise a vehicle to working height with a floor hoist.
2. Raise a vehicle with a floor jack and support with safety stands.
3. Properly operate transmission jack to safely support and remove or install a transmission from a vehicle.
4. Drill a hole using a twist drill and electric hand drill.
5. Cut threads using the appropriate tap to receive a threaded fastener.
6. Remove a broken stud using a stud remover to allow for replacement.
7. Cut metal using a hacksaw to size the workpiece.
8. Cut metal using a cold chisel to remove excess metal.
9. Draw file a metal workpiece using a single cut bastard file.

B. PRACTICING SHOP RELATED SKILLS (continued)

10. Set up oxy-acetylene torch using all safety precautions to prepare for welding or cutting.
11. Light oxy-acetylene torch using spark lighter to achieve proper flame.
12. Cut metal using an oxy-acetylene torch to produce a clean and even cut.
13. Puddle weld two metal workpieces using oxy-acetylene torch to join two metal workpieces together.
14. Braze weld metal using oxy-acetylene torch to join two pieces of metal.
15. Determine specifications using shop manuals to establish fits, capacities and settings.
16. Determine parts and labor charges using flat-rate manuals to prepare a customer invoice.
17. Measure selected pieces of metal using the outside micrometer to determine proper fits.
18. Charge a battery using a battery charger to a full charge.
19. Jump start a car with a dead battery using jumper cables to start the car.
20. Change crankcase oil using a drain pan to prevent sludge accumulation.

C. USING EMPLOYABILITY SKILLS

1. Investigate employment information using sources of employment information to identify employment opportunities.
2. Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.
3. Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.
4. Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.

C. USING EMPLOYABILITY SKILLS (continued)

5. Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.
6. Analyze career ladder using available resources to describe job progression in an occupation.
7. Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or other alternatives.
8. Prepare a resume using personal information to apply for a job.
9. Write a letter of application using personal notes to apply/inquire about a job.
10. Complete a job application using personal notes to apply for a job.
11. Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.
12. Complete a job interview using communication and interpersonal skills to become employed.
13. Describe personal criteria using references to identify acceptable job offers.
14. Demonstrate interpersonal skills to achieve successful relationships with others.
15. Identify source of continuing education for an occupation using available resources to identify career ladder alternatives.
16. Describe job termination procedures using a knowledge of the occupational area to leave a particular job.

D. PRACTICING MICHIGAN AUTO REPAIR ACT

1. Review motor vehicle act using appropriate information to provide the learner with a basic knowledge of the repair act.
2. Prepare written estimate using the appropriate form to provide the consumer with repair costs.
3. Prepare a waiver of estimate using the appropriate form to comply with the Michigan Auto Repair Act.
4. Prepare a final bill using the appropriate form to provide the consumer with cost information.

D. PRACTICING MICHIGAN AUTO REPAIR ACT (continued)

5. Review mechanic certification using the appropriate information to provide the learner with a basic knowledge of mechanic certification.
6. Prepare mechanic test registration form using appropriate form to provide the learner an opportunity to fill the form out correctly.

E. CERTIFICATION: ENGINE TUNE-UP (IGNITION SYSTEM)

1. Replace spark plugs using appropriate equipment to restore spark plug operation.
2. Gap spark plugs using appropriate equipment to allow for proper firing.
3. Clean spark plugs using appropriate equipment to remove all carbon from electrode insulator and shell.
4. Replace ignition points using appropriate equipment to provide specified dwell angle.
5. Replace condenser using appropriate equipment to provide proper point operation.
6. Test condenser using appropriate equipment to detect any deviation from manufacturer's specifications.
7. Test point dwell using appropriate equipment to detect point dwell within manufacturer's specifications.
8. Adjust point dwell using appropriate equipment to restore point dwell within manufacturer's specifications.
9. Test spark plug wire using appropriate equipment to detect resistance outside manufacturer's specifications.
10. Replace spark plug wires using appropriate equipment to restore spark plug wire operation.
11. Test secondary circuit continuity using appropriate equipment to detect resistance outside manufacturer's specifications.
12. Test primary circuit using appropriate equipment to detect resistance outside manufacturer's specifications.
13. Test ignition coil using appropriate equipment to detect any deviation from manufacturer's specifications.
14. Replace distributor cap using appropriate equipment to restore distributor cap operation.

E. CERTIFICATION: ENGINE TUNE-UP (IGNITION SYSTEM) (continued)

15. Replace distributor rotor using appropriate equipment to restore distributor rotor operation.
16. Test ignition timing using appropriate equipment to detect any deviation from manufacturer's specifications.
17. Adjust ignition timing using appropriate equipment to restore ignition timing to manufacturer's specifications.
18. Test automatic spark advance mechanism using appropriate equipment to detect any deviation from manufacturer's specifications.
19. Replace automatic spark advance mechanism using appropriate equipment to restore automatic spark advance mechanism.
20. Inspect distributor using appropriate equipment to detect parts worn beyond manufacturer's specifications.
21. Replace distributor using appropriate equipment to restore distributor operation.
22. Rebuild distributor using appropriate equipment to restore distributor operation.
23. Test electronic control unit using appropriate equipment to detect any deviation from manufacturer's specifications.
24. Replace electronic control unit using appropriate equipment to restore electronic control unit operation.
25. Test electronic pickup coil using appropriate equipment to detect any deviation from manufacturer's specifications.
26. Replace electronic pickup coil using appropriate equipment to restore electronic control unit operation.
27. Test ignition system using appropriate analyzer to detect any meter reading, digital readout, or scope display deviation from manufacturer's specifications.

F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM)

1. Test carburetor adjustment using combustion analyzer to detect a carburetor mixture deviating from manufacturer's specifications.
2. Test carburetor adjustment using infrared tester to detect hydrocarbon and carbon monoxide levels exceeding manufacturer's specifications.

F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM) (continued)

3. Test carburetor adjustment using propane enrichment apparatus.
4. Adjust carburetor idle mixture using appropriate equipment to restore idle mixture within manufacturer's specified range with attachment hardware tightened, and there are no fuel or vacuum leaks.
5. Adjust anti-stall device using appropriate equipment to restore anti-stall operation.
6. Inspect carburetor linkage using appropriate equipment to detect all binding and worn parts.
7. Check carburetor for vacuum leaks using appropriate equipment to detect all mounting and/or assembly vacuum leaks.
8. Remove carburetor air cleaner using appropriate equipment to restore air cleaner operation according to manufacturer's specifications and so that air cleaner is installed.
9. Check carburetor air cleaner element using appropriate equipment to detect any restriction (dirt) which decreases air flow beyond manufacturer's specifications.
10. Clean carburetor air cleaner using appropriate equipment to restore air cleaner operation.
11. Clean automatic choke using appropriate equipment to restore choke operation.
12. Adjust automatic choke using appropriate equipment to restore choke operation.
13. Check manifold heat riser valve using appropriate equipment to detect binding.
14. Replace manifold heat riser valve using appropriate equipment to restore valve operation.
15. Clean heat riser passages using appropriate equipment to restore heat riser passages.
16. Adjust float using appropriate equipment to restore float operation.
17. Adjust carburetor metering rods using appropriate equipment to restore carburetor metering rod operation.
18. Replace carburetor metering jets using appropriate equipment to restore carburetor metering jet operation.

F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM) (continued)

19. Replace carburetor using appropriate equipment to restore carburetor operation.
20. Rebuild carburetor using appropriate equipment to restore carburetor operation.
21. Replace fuel filter unit using appropriate equipment to restore fuel filter operation.
22. Test fuel pump using appropriate equipment to detect deviations in pressure, volume or vacuum readings.
23. Replace fuel pump using appropriate equipment to restore fuel pump operation.
24. Test fuel injection system using appropriate equipment to detect any deviation of fuel flow, timing or electrical circuit continuity.
25. Replace electrical fuel injection computer using appropriate equipment to restore electrical fuel injection computer operation.
26. Test wiring harness for electronic fuel injection using appropriate equipment to detect any open, shorted, or out of tolerance circuits.
27. Replace wiring harness for electronic fuel injection using appropriate equipment to restore wiring harness operation.
28. Replace fuel injection nozzle using appropriate equipment to restore fuel injection nozzle operation.
29. Rebuild fuel injection nozzle using appropriate equipment to restore fuel injection nozzle operation.
30. Replace fuel injection pump using appropriate equipment to restore fuel injection pump operation.
31. Rebuild fuel injection pump using appropriate equipment to restore fuel injection pump operation.
32. Test waste gate adjustment using appropriate equipment to detect any deviation from manufacturer's specifications.
33. Adjust waste gate using appropriate equipment to restore waste gate operation.
34. Replace turbo-charger using appropriate equipment to restore turbo-charger operation.

F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM) (continued)

35. Rebuild turbo-charger using appropriate equipment to restore turbo-charger operation.
36. Replace fuel lines using appropriate equipment to restore fuel line operation.
37. Replace fuel tank using appropriate equipment to restore fuel tank operation.
38. Replace fuel level sending unit using appropriate equipment to restore fuel sending unit operation.

G. CERTIFICATION: ENGINE TUNE-UP (EMISSION CONTROL SYSTEM)

1. Test P.C.V. system using appropriate equipment to detect any deviations from manufacturer's operating specifications.
2. Replace P.C.V. valve using appropriate equipment to restore P.C.V. valve operation.
3. Replace P.C.V. valve hoses using appropriate equipment to restore P.C.V. valve hose operation.
4. Replace vacuum hoses using appropriate equipment to restore vacuum hose operation.
5. Test idle solenoid using appropriate equipment to detect any deviation from manufacturer's operation specifications.
6. Replace idle solenoid using appropriate equipment to restore idle solenoid operation.
7. Test thermostatic air cleaner using appropriate equipment to detect any deviation from manufacturer's operating specifications.
8. Adjust thermostatic air cleaner using appropriate equipment to restore thermostatic air cleaner operation.
9. Replace thermostatic air cleaner using appropriate equipment to restore thermostatic air cleaner operation.
10. Test exhaust gas recirculation valve using appropriate equipment to detect any deviation from manufacturer's operation specifications.
11. Replace exhaust gas recirculation valve using appropriate equipment to restore exhaust gas recirculation valve operation.

G. CERTIFICATION: ENGINE TUNE-UP (EMISSION CONTROL SYSTEM) (continued)

12. Test fuel evaporation using appropriate equipment to detect any deviation from manufacturer's operating specifications.
13. Replace closed system charcoal canister filter using appropriate equipment to restore closed system charcoal canister filter operation.
14. Test vacuum advance/retard device using appropriate equipment to detect any deviation from manufacturer's operating specifications.
15. Replace vacuum advance/retard device using appropriate equipment to restore vacuum advance/retard device operation.
16. Test electrical advance/retard device using appropriate equipment to detect any deviations from manufacturer's specifications.
17. Replace deceleration valve using appropriate equipment to restore deceleration valve operation.
18. Test air injection system using appropriate equipment to detect any deviation from manufacturer's operating specifications.
19. Replace air pump using appropriate equipment to restore air pump operation.
20. Replace diverter and anti-backfire valve using appropriate equipment to restore diverter and anti-backfire valve operation.
21. Test back pressure of exhaust system using appropriate equipment to detect any deviation from manufacturer's operating specifications.
22. Replace catalytic converter using appropriate equipment to restore catalytic converter operation.
23. Test emission control system using propane enrichment apparatus to detect speed changes exceeding manufacturer's specifications.
24. Replace beads in catalytic converter using appropriate equipment to restore catalytic converter operation.

H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL)

1. Test battery electrolyte level using appropriate equipment to detect any deviation from manufacturer's specifications.
2. Test battery using hydrometer to detect any cell with specific gravity less than 1.220.
3. Test battery for surface leakage using appropriate equipment to detect any surface leakage.

H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL) (continued)

4. Test battery voltage using appropriate equipment to detect a low voltage condition.
5. Test battery capacity (load) using appropriate equipment to detect any deviation from manufacturer's specifications.
6. Clean battery post and cable connections using appropriate equipment to remove corrosion and foreign material.
7. Test ground system resistance using appropriate equipment to detect ground system resistance.
8. Replace battery cables using appropriate equipment to restore battery cable operation.
9. Charge battery using appropriate equipment to restore battery charge.
10. Test charging system output using appropriate equipment to detect any deviation from manufacturer's specifications for output.
11. Test generator output using appropriate equipment to detect any deviation from manufacturer's specifications for output.
12. Test alternator output using appropriate equipment to detect any deviation from manufacturer's specifications for output.
13. Replace generator or alternator using appropriate equipment to restore generator or alternator operation.
14. Rebuild generator using appropriate equipment to restore generator operation.
15. Rebuild alternator using appropriate equipment to restore alternator operation.
16. Replace charging system alternator using appropriate equipment to restore charging system alternator operation.
17. Test starter control circuit using appropriate equipment to detect resistance outside manufacturer's specifications.
18. Test starter current draw using appropriate equipment to detect current draw that exceeds manufacturer's specifications.
19. Replace starter solenoid using appropriate equipment to restore starter solenoid operation.

H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL) (continued)

20. Test electrical motors using appropriate equipment to detect current draw and RPM outside manufacturer's specifications.
21. Replace starter using appropriate equipment to restore starter operation.
22. Rebuild starter using appropriate equipment to restore starter operation.
23. Test switches using appropriate equipment to detect resistance outside manufacturer's specifications.
24. Replace switches using appropriate equipment to restore switch operation.
25. Test fuses using appropriate equipment to detect open fuses.
26. Replace fuses using appropriate equipment to restore fuse operation.
27. Test circuit breakers using appropriate equipment to detect circuit breakers opening outside of manufacturer's specifications.
28. Replace circuit breakers using appropriate equipment to restore circuit breaker operation.
29. Replace fuse block assembly using appropriate equipment to restore fuse block assembly operation.
30. Test lighting system using appropriate equipment to detect faulty bulbs.
31. Replace light bulbs using appropriate equipment to restore light bulbs.
32. Replace bulb sockets using appropriate equipment to restore bulb socket operation.
33. Adjust headlights using appropriate equipment to restore headlight adjustment.
34. Test parking light and headlight circuit using appropriate equipment to detect circuit resistance outside manufacturer's specifications.
35. Replace dimmer switch using appropriate equipment to restore dimmer switch operation.
36. Test turn signal circuit using appropriate equipment to detect circuit resistance outside manufacturer's specification
37. Replace turn signal using appropriate equipment to restore turn signal operation.

H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL) (continued)

38. Adjust back up light switch using appropriate equipment to restore back up light operation.
39. Replace back up light switch using appropriate equipment to restore back up light operation.
40. Adjust stop light switch using appropriate equipment to restore stop light switch operation.
41. Replace stop light switch using appropriate equipment to restore stop light operation.
42. Test horn circuit using appropriate equipment to detect resistance outside manufacturer's specifications.
43. Test horn relay using appropriate equipment to detect operation outside of manufacturer's specifications.
44. Replace horn relay using appropriate equipment to restore horn operation.
45. Test windshield wiper circuit using appropriate equipment to detect resistance outside manufacturer's specifications.
46. Replace windshield wiper motor using appropriate equipment to restore windshield wiper operation.
47. Replace windshield washer motor using appropriate equipment to restore windshield washer operation.
48. Test constant voltage regulator using appropriate equipment to detect operation outside manufacturer's specifications.
49. Replace constant voltage regulator using appropriate equipment to restore constant voltage regulator operation.
50. Test instrument gauges using appropriate equipment to detect operation outside manufacturer's specifications.
51. Replace instrument gauges using appropriate equipment to restore instrument gauge operation.
52. Test sending units using appropriate equipment to detect operation outside manufacturer's specifications.
53. Replace sending units using appropriate equipment to restore sending unit operation.

H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL) (continued)

54. Test warning lamps using appropriate equipment to detect operation outside manufacturer's specifications.
55. Replace warning lamps using appropriate equipment to restore warning lamp operation.

I. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL ACCESSORIES)

1. Test cruise control unit using appropriate equipment to detect operation outside of manufacturer's specifications.
2. Replace cruise control components using appropriate equipment to restore cruise control operations.
3. Test automatic alarm system using appropriate equipment to detect operation outside of manufacturer's specifications.
4. Replace automatic alarm system components using appropriate equipment to restore automatic alarm system operation.
5. Test radio power circuit using appropriate equipment to detect operation outside of manufacturer's specifications.
6. Test radio speaker using appropriate equipment to detect all cracks or separations.
7. Replace radio speaker using appropriate equipment to restore radio speaker operation.
8. Test radio antenna using appropriate equipment to detect resistance outside manufacturer's specifications.
9. Replace radio antenna using appropriate equipment to restore radio antenna operation.
10. Adjust radio antenna using appropriate equipment to restore radio volume.
11. Replace power antenna using appropriate equipment to restore power antenna operation.
12. Replace power window motors using appropriate equipment to restore power window operation.
13. Replace power seat motors using appropriate equipment to restore power seat operation.
14. Test cigarette lighter circuit using appropriate equipment to detect resistance outside of manufacturer's specifications.

I. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL ACCESSORIES) (continued)

15. Replace cigarette lighter receptacle using appropriate equipment to restore cigarette lighter operation.
16. Test rear window defogger circuit using appropriate equipment to detect resistance outside of manufacturer's specifications.
17. Test power trunk mechanism using appropriate equipment to detect resistance outside of manufacturer's specifications.
18. Replace power trunk mechanism using appropriate equipment to restore power trunk operation.

J. CERTIFICATION: BRAKES (BRAKES AND BRAKING SYSTEMS)

1. Test brake operation using appropriate equipment to detect any deviations.
2. Test brake hose, lines, and fittings using appropriate equipment to detect any leaking, kinked or cracked hoses, lines or fittings.
3. Flush brake system using appropriate equipment to restore brake fluid operation.
4. Replace brake hose using appropriate equipment to restore brake hose operation.
5. Replace brake lines using appropriate equipment to restore brake line operation.
6. Bleed brake system using appropriate equipment to restore brake operation.
7. Adjust brake shoes using appropriate equipment to restore brake shoe operation.
8. Free parking brake cable and linkage using appropriate equipment to restore parking brake operation.
9. Adjust parking brake linkage using appropriate equipment to restore parking brake operation.
10. Replace parking brake cable and linkage using appropriate equipment to restore parking brake operation.
11. Replace parking brake external band using appropriate equipment to restore parking brake operation.
12. Replace brake shoes using appropriate equipment to restore brake operation.
13. Replace self-adjusters using appropriate equipment to restore self-adjuster operation.

J. CERTIFICATION: BRAKES (BRAKES AND BRAKING SYSTEMS) (continued)

14. Replace wheel cylinder using appropriate equipment to restore wheel cylinder operation.
15. Rebuild wheel cylinder using appropriate equipment to restore wheel cylinder operation.
16. Grind brake drum using appropriate equipment to restore drum operation.
17. Recondition backing plate using appropriate equipment to restore backing plate operation.
18. Replace disc brake rotor using appropriate equipment to restore disc brake rotor operation.
19. Reface disc brake rotor using appropriate equipment to restore disc brake rotor operation.
20. Replace caliper assembly using appropriate equipment to restore caliper assembly operation.
21. Rebuild caliper using appropriate equipment to restore caliper operation.
22. Replace master cylinder using appropriate equipment to restore master cylinder operation.
23. Rebuild master cylinder using appropriate equipment to restore master cylinder operation.
24. Replace hydraulic power assist unit using appropriate equipment to restore hydraulic power brake operation.
25. Replace hydro-brake booster unit using appropriate equipment to restore hydro-brake booster unit operation.
26. Replace proportioning or metering valve (combination valve) using appropriate equipment to restore proportioning meter operation.
27. Test brake anti-lock system using appropriate equipment to detect any deviation.
28. Replace brake anti-lock system components using appropriate equipment to restore brake anti-lock system operation.

K. CERTIFICATION: FRONT END AND STEERING SYSTEMS (STEERING SYSTEMS)

1. Inspect steering gear using appropriate equipment to detect all parts worn beyond manufacturer's specifications.

K. CERTIFICATION: FRONT END AND STEERING SYSTEMS (STEERING SYSTEMS) (continued)

2. Inspect steering linkage using appropriate equipment to detect all parts worn beyond manufacturer's specifications.
3. Lubricate steering linkage using appropriate equipment to maintain lubrication.
4. Check manual steering gear fluid level using appropriate equipment to detect all fluid levels less than operating levels.
5. Check power steering fluid level using appropriate equipment to detect all fluid levels less than operating levels.
6. Check tire pressure using appropriate equipment and pressure gauge to detect tire pressures deviating from manufacturer's specifications.
7. Rotate tires using appropriate equipment to restore even tire wear.
8. Balance wheels and tires (on-the-car dynamic) using appropriate equipment to restore minimum vibrations at road speed.
9. Balance wheels and tires (off-the-car dynamic) using appropriate equipment to restore minimum vibrations at road speed.
10. Balance wheels and tires (off car static) using appropriate equipment to restore minimum vibrations at road speed.
11. Replace steering linkage components using appropriate equipment to restore steering and so all hardware will be torqued.
12. Replace manual steering sector using appropriate equipment to restore steering so that steering effort will be even from lock to lock and all hardware is torqued.
13. Adjust steering sector using appropriate equipment to restore steering sector "play".
14. Align front end using appropriate equipment to restore front end alignment.
15. Adjust toe using appropriate equipment to restore toe-in or toe-out within manufacturer's specifications.
16. Align rear wheels using appropriate equipment to restore rear wheel alignment.
17. Replace steering damper using appropriate equipment to restore steering damper operation.

K. CERTIFICATION: FRONT END AND STEERING SYSTEMS (STEERING SYSTEMS) (continued)

18. Replace power steering hoses using appropriate equipment to restore steering hose operations.
19. Replace belts using appropriate equipment to restore belt operation.
20. Replace power steering cylinder using appropriate equipment to restore power steering cylinder operation.
21. Rebuild power steering cylinder using appropriate equipment to restore power steering cylinder operation.
22. Replace power steering control valve assembly using appropriate equipment to restore power steering control valve operation.
23. Rebuild power steering control valve assembly using appropriate equipment to restore power steering control valve operation.
24. Replace power steering pump using appropriate equipment to restore power steering pump operation.
25. Rebuild power steering pump using appropriate equipment to restore power steering pump operation.
26. Rebuild rack and pinion steering assembly using appropriate equipment to restore rack and pinion power steering operation.
27. Rebuild rack and pinion manual steering assembly using appropriate equipment to restore rack and pinion manual steering operation.
28. Replace steering wheel using appropriate equipment to restore steering wheel operation.
29. Replace ignition switch rack using appropriate equipment to restore ignition switch operation.
30. Replace steering mast jacket using appropriate equipment to restore steering mast jacket functions.

L. CERTIFICATION: FRONT END AND STEERING SYSTEMS (SUSPENSION SYSTEMS)

1. Inspect tires and wheels using appropriate equipment to detect damage and unusual wear.
2. Inspect suspension system using appropriate equipment to detect all parts worn beyond manufacturer's specification.
3. Replace suspension bushings using appropriate equipment to restore suspension bushing operation.

L. CERTIFICATION: FRONT END AND STEERING SYSTEMS (SUSPENSION SYSTEMS) (continued)

4. Repack wheel bearings using appropriate equipment to restore wheel bearing lubrication.
5. Replace front wheel bearings (drum brake) using appropriate equipment to restore wheel bearing operations.
6. Replace front wheel bearings (disc brakes) using appropriate equipment to restore wheel bearing operations.
7. Replace shock absorbers using appropriate equipment to restore shock absorber operation.
8. Replace ball joints using appropriate equipment to restore ball joint operation.
9. Replace coil spring(s) using appropriate equipment to restore coil spring operation.
10. Replace control arms using appropriate equipment to restore control arm operation.
11. Replace torsion bar(s) using appropriate equipment to restore torsion bar operation.
12. Replace spindle using appropriate equipment to restore spindle operation.
13. Replace king pins using appropriate equipment to restore king pin operation.
14. Replace McPherson Strut assembly using appropriate equipment to restore McPherson Strut assembly operation.
15. Rebuild McPherson Strut assembly using appropriate equipment to restore McPherson Strut assembly operation.
16. Replace trunion pin assembly using appropriate equipment to restore trunion pin operation.
17. Replace leaf spring assembly using appropriate equipment to restore leaf spring operation.

M. CERTIFICATION: ENGINE REPAIR (DIAGNOSE THE ENGINE)

1. Test cylinder balance using appropriate equipment to detect a cylinder to cylinder deviation exceeding 10%.
2. Test cylinder leakage using appropriate equipment to detect leakage in excess of 20%.

M. CERTIFICATION: ENGINE REPAIR (DIAGNOSE THE ENGINE) (continued)

3. Test vacuum leaks using appropriate equipment to detect all vacuum leaks.
4. Test valve train and guides using appropriate equipment to detect any deviations from manufacturer's specifications.
5. Detect oil leaks using appropriate equipment to detect oil leaks.
6. Detect engine noises using appropriate equipment to detect all noises which may lead to engine malfunction.

N. CERTIFICATION: ENGINE REPAIR (CYLINDER BLOCK)

1. Clean engine using appropriate equipment to remove all loose dirt and oil.
2. Replace core plugs using appropriate equipment to restore core plug operation.
3. Test oil pump pressure using appropriate equipment to detect any deviation from manufacturer's specifications.
4. Test oil pressure relief valve using appropriate equipment to detect any deviation from manufacturer's specifications.
5. Replace engine mounts using appropriate equipment to restore engine mount operation.
6. Replace engine assembly using appropriate equipment to restore engine assembly operation.
7. Replace oil pans using appropriate equipment to restore oil pan operation.
8. Replace rod bearings using appropriate equipment to restore rod bearing operation.
9. Replace pistons using appropriate equipment to restore piston operation.
10. Replace crankshaft using appropriate equipment to restore crankshaft operation.
11. Test engine block using appropriate equipment to detect block warpage exceeding manufacturer's specifications.

O. CERTIFICATION: ENGINE REPAIR (CYLINDER HEAD)

1. Inspect rocker arms using appropriate equipment to detect rocker arm lubrication levels outside manufacturer's specifications.
2. Adjust hydraulic valve lifters using appropriate equipment to restore hydraulic valve lifter clearances.

O. CERTIFICATION: ENGINE REPAIR (CYLINDER HEAD) (continued)

3. Adjust mechanical lifters using appropriate equipment to restore mechanical lifter clearances.
4. Test valve lifters using appropriate equipment to detect bleed down times outside manufacturer's specifications.
5. Replace intake manifold using appropriate equipment to restore intake manifold operation.
6. Replace cylinder head using appropriate equipment to restore cylinder head operation.
7. Test cylinder head using appropriate equipment to detect cracks and head warpage beyond manufacturer's specifications.
8. Rebuild cylinder head using appropriate equipment to restore cylinder head operation.
9. Replace harmonic balancer using appropriate equipment to restore harmonic balancer operation.
10. Replace timing chain or belt using appropriate equipment to restore timing chain or belt.
11. Replace timing gear using appropriate equipment to restore timing gear operation.
12. Replace camshaft using appropriate equipment to restore camshaft operation.
13. Replace camshaft bearings using appropriate equipment to restore camshaft bearing operation.

P. CERTIFICATION: ENGINE REPAIR (EXHAUST SYSTEM)

1. Check exhaust system for leaks and restrictions using appropriate equipment to detect leaks and restrictions.
2. Replace exhaust system supports using appropriate equipment to replace exhaust system supports.
3. Replace muffler using appropriate equipment to replace muffler.
4. Replace tailpipe using appropriate equipment to replace a tailpipe to manufacturer's specifications.
5. Replace exhaust pipe using appropriate equipment to replace an exhaust pipe.
6. Replace exhaust manifold using appropriate equipment to replace an exhaust manifold.

Q. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES
(MANUAL TRANSMISSIONS)

1. Adjust manual clutch using appropriate equipment to restore manual clutch operation.
2. Adjust hydraulic clutch free travel using appropriate equipment to restore hydraulic clutch free travel operation.
3. Adjust shift linkage using appropriate equipment to restore shift linkage operation.
4. Replace extension housing seal and bushing using appropriate equipment to restore extension housing seal and bushing operation.
5. Replace manual transmission using appropriate equipment to restore manual transmission operation.
6. Replace pressure plate assembly using appropriate equipment to restore pressure plate operation.
7. Replace and align clutch disc using appropriate equipment to restore clutch operation.
8. Replace clutch release bearing using appropriate equipment to restore clutch bearing operation.
9. Replace clutch release fork using appropriate equipment to restore clutch release fork operation.
10. Replace pilot bearing using appropriate equipment to restore pilot bearing operation.
11. Test flywheel runout using appropriate equipment to detect any flywheel runout deviations.
12. Replace flywheel using appropriate equipment to restore flywheel operation.
13. Test bellhousing runout using appropriate equipment to detect any deviation from manufacturer's specifications.
14. Rebuild manual transmission using appropriate equipment to restore manual transmission operation.
15. Replace hydraulic clutch slave cylinder using appropriate equipment to restore hydraulic clutch cylinder operation.
16. Rebuild hydraulic clutch slave cylinder using appropriate equipment to restore hydraulic clutch slave cylinder operation.

Q. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES
(MANUAL TRANSMISSIONS) (continued)

17. Replace hydraulic clutch master cylinder using appropriate equipment to restore hydraulic clutch master cylinder operation.
18. Rebuild hydraulic clutch master cylinder using appropriate equipment to restore hydraulic clutch master cylinder operation.

R. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES
(DRIVE LINES)

1. Test drive line using appropriate equipment to detect all parts worn beyond manufacturer's specifications.
2. Lubricate universal joints using appropriate equipment to restore universal joint operation.
3. Replace universal joints using appropriate equipment to restore universal joint operation.
4. Replace trunion joints using appropriate equipment to restore trunion joint operation.
5. Lubricate speedometer cable using appropriate equipment to restore speedometer cable operation.
6. Replace speedometer cable using appropriate equipment to restore speedometer cable operation.
7. Replace speedometer drive gear using appropriate equipment to restore speedometer drive gear operation.
8. Replace axle seal using appropriate equipment to restore axle seal operation.
9. Replace rear axle bearing using appropriate equipment to restore rear axle bearing operation.
10. Balance drive shaft in the car using appropriate equipment to restore drive shaft operation.
11. Replace transmission mount using appropriate equipment to restore transmission mount operation.
12. Check drive line angles using appropriate equipment to detect any deviation in drive line angles.
13. Replace integral differential assembly using appropriate equipment to restore integral differential assembly operation.

R. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES
(DRIVE LINES) (continued)

14. Replace removable differential assembly using appropriate equipment to restore removable differential assembly operation.
15. Rebuild integral differential assembly using appropriate equipment to restore integral differential assembly operation.
16. Rebuild removable differential assembly using appropriate equipment to restore removable differential assembly operation.
17. Replace trans-axle assembly using appropriate equipment to restore trans-axle assembly operation.
18. Rebuild trans-axle assembly using appropriate equipment to restore trans-axle assembly operation.
19. Replace front-drive axle assemblies using appropriate equipment to restore front-drive axle assemblies.
20. Rebuild 4 wheel drive locking hubs using appropriate equipment to restore 4 wheel drive locking hubs.

S. CERTIFICATION: AUTOMATIC TRANSMISSIONS (AUTOMATIC TRANSMISSIONS)

1. Test transmission in car using pressure to detect any pressure deviations.
2. Test transmission in car using stall procedures to detect any deviation in pressure readings at shift points and excessive slippage.
3. Clean transmission oil strainer using appropriate equipment to remove all foreign matter.
4. Replace transmission filter using appropriate equipment to restore transmission filter operation.
5. Adjust automatic transmission shift linkage using appropriate equipment to restore automatic transmission shift linkage operation.
6. Test vacuum shift modulator using appropriate equipment to detect any vacuum leak down deviations.
7. Replace vacuum shift modulator using appropriate equipment to restore vacuum shift modulator operation.
8. Adjust bands using appropriate equipment to restore band adjustment.
9. Replace transmission governor using appropriate equipment to restore transmission governor operation.

S. CERTIFICATION: AUTOMATIC TRANSMISSIONS (AUTOMATIC TRANSMISSIONS) (continued)

10. Clean transmission governor using appropriate equipment to remove foreign material.
11. Clean transmission valve body using appropriate equipment to remove foreign material.
12. Replace automatic transmission with converter assembly using appropriate equipment to restore automatic transmission operation.
13. Replace automatic transmission without converter assembly using appropriate equipment to restore automatic transmission.
14. Rebuild automatic transmission assembly using appropriate equipment to restore automatic transmission operation.
15. Test converter turbine end play using appropriate equipment to detect any deviation of converter turbine end play.
16. Air pressure test transmission on a bench using air pressure to detect any deviation of clutch application and leaks.
17. Flush converter assembly using pressure to remove all residue.
18. Flush automatic transmission cooler assembly using pressure to remove all residue.
19. Replace torque converter using appropriate equipment to restore torque converter operation.
20. Replace extension housing seal and bushing using appropriate equipment to restore extension housing seal and bushing.
21. Splice transmission cooler lines using appropriate equipment to restore transmission cooler line operation.

T. CERTIFICATION: HEATING AND AIR CONDITIONING
(HEATING AND AIR CONDITIONING)

1. Test control cables using appropriate equipment to detect any binding, disconnected, or out-of-adjustment cables.
2. Test electrical control circuits using appropriate equipment to detect any deviations in resistance or voltage readings.
3. Replace compressor belts using appropriate equipment to restore compressor belt operation.
4. Test vacuum components using appropriate equipment to detect any binding or vacuum leaks.

T. CERTIFICATION: HEATING AND AIR CONDITIONING
(HEATING AND AIR CONDITIONING) (continued)

5. Replace vacuum components using appropriate equipment to restore vacuum component operation.
6. Test air conditioning thermal switches using appropriate equipment to detect open or out-of-tolerance thermal switches.
7. Test blower using appropriate equipment to detect excessive current draw.
8. Replace blower motor using appropriate equipment to restore blower motor operation.
9. Test thermostatic clutch switch using appropriate equipment to detect any deviation from specified operating temperature.
10. Replace thermostatic clutch switch using appropriate equipment to restore thermostatic clutch switch operation.
11. Test air conditioning magnetic clutch switch using appropriate equipment to detect any slipping, overheating or bearing noise.
12. Replace air conditioning magnetic clutch using appropriate equipment to restore air conditioning magnetic clutch switch operation.
13. Test clutch and pulley assembly using appropriate equipment to detect any slipping, overheating, or bearing noise.
14. Replace clutch and hub assembly (rotary type) using appropriate equipment to restore clutch and hub assembly operation.
15. Replace compressor seals using appropriate equipment to restore compressor seal operation.
16. Test air conditioner charge using appropriate equipment to detect a high-low ratio.
17. Charge system using one pound cans to restore high-low ratio.
18. Charge system using bulk charge to restore high-low ratio.
19. Perform leak test using electronic tester to detect all freon leaks.
20. Replace refrigerant lines using appropriate equipment to restore refrigerant line operation.
21. Fabricate refrigerant lines using appropriate equipment to restore refrigerant line operation.
22. Test compressor oil level using appropriate equipment to detect deviations in oil level.

T. CERTIFICATION: HEATING AND AIR CONDITIONING
(HEATING AND AIR CONDITIONING) (continued)

23. Test dryer using appropriate equipment to detect any oil leaks in barrel icing or excessive temperature differential.
24. Replace dryer in air conditioning unit using appropriate equipment to restore dryer operation.
25. Replace condenser in air conditioning unit using appropriate equipment to restore condenser operation.
26. Replace evaporator using appropriate equipment to restore evaporator operation.
27. Replace heater core using appropriate equipment to restore heater core operation.
28. Replace measured orifice valve (expansion valve) using appropriate equipment to restore measured orifice valve operation.
29. Test throttle suctioning valve using appropriate equipment to detect any deviation.
30. Replace throttle suctioning valve using appropriate equipment to restore throttle-suctioning valve operation.
31. Test compressor reed plates using appropriate equipment to detect any external leakage.
32. Replace compressor reed plates using appropriate equipment to restore compressor reed plate operation.
33. Replace compressor using appropriate equipment to restore compressor operation.
34. Rebuild rotary compressor (swash-plate) using appropriate equipment to restore rotary compressor operation.
35. Install air conditioning system using appropriate equipment to provide air conditioner service.

U. CERTIFICATION: HEATING AND AIR CONDITIONING (COOLING SYSTEMS)

1. Test coolant/anti-freeze using appropriate equipment to determine freezing point.
2. Install coolant/anti-freeze using appropriate equipment to protect cooling system and engine for local temperature conditions.

U. CERTIFICATION: HEATING AND AIR CONDITIONING (COOLING SYSTEMS) (continued)

3. Inspect water hoses using appropriate equipment to detect cracked, soft, or worn hoses.
4. Determine cause of overheating using appropriate equipment to restore cooling system operation.
5. Test thermal sensing switch using appropriate equipment to detect a switch which opens or closes outside of manufacturer's specifications.
6. Replace thermal sensing switch using appropriate equipment to restore switch operation.
7. Check variable speed fan clutch using appropriate equipment to detect lock up, bearing wear, or excessive slippage.
8. Replace variable speed fan clutch using appropriate equipment to restore clutch operation.
9. Clean cooling system using appropriate equipment and chemicals to remove impurities, scale, and dirt.
10. Replace thermostat using appropriate equipment to restore thermostat operation.
11. Test thermostat using appropriate equipment to detect opening temperature deviation from temperature stamped on thermostat.
12. Test radiator pressure cap using appropriate equipment to detect a cap opening at a different pressure than that stamped on the cap.
13. Test cooling system using appropriate equipment including pressure tester to detect any pressure drop.
14. Replace heater hoses using appropriate equipment to restore heater hose operation.
15. Replace radiator hoses using appropriate equipment to restore radiator hose operation.
16. Replace radiator using appropriate equipment to restore radiator operation.
17. Rebuild blower assembly using appropriate equipment to restore blower operation.
18. Replace water pump using appropriate equipment to restore water pump operation.
19. Replace drive belts using appropriate equipment to restore belt operation.

Duty: Practicing Automotive Safety		Duty No. A	
		Task No. 14	
Task: Review personal safety rules to become aware of personal safety rules while performing in the automotive lab.			
Achievement Indicators:	The learner:	Yes	No
1. Wore eye protection -		_____	_____
2. Removed rings and other jewels -		_____	_____
3. Wore proper apparel for the job being performed -		_____	_____
4. Provided leggings and safety shoes -		_____	_____
5. Provided respirators for dusty or toxic atmospheric conditions -		_____	_____
6. Provided a basic knowledge of safety -		_____	_____
7. Demonstrated a proper attitude -		_____	_____
8. Demonstrated knowledge of emergency procedures -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and all personal safety rules are learned.			
Tools and Equipment:	Resources:		

Duty: Practicing Automotive Safety		Duty No. A																																																	
		Task No. 2																																																	
Task: Review safety rules for handling flammables to become aware of potential hazards while handling flammables in the automotive lab.																																																			
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Duty: Practicing Automotive Safety		Duty No. A	
		Task No. 15	
Task: Review safety rules for servicing the engine block to become aware of potential hazards while working on a vehicle.			
Achievement Indicators:	The learner:	Yes	No
1. Listed personal safety rules -		_____	_____
2. Listed safety rules for power and hand tool use -		_____	_____
3. Listed safety rules for equipment in servicing the engine block -		_____	_____
4. Listed sources of potential electrical shock -		_____	_____
5. Listed sources of potential fire hazards -		_____	_____
6. Listed sources of potential burns from heat and chemicals -		_____	_____
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8. Listed methods of providing proper ventilation -		_____	_____
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10. Listed sources of potential hazards while servicing the engine block -		_____	_____
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6. Listed sources of potential burns from heat and chemicals -		_____	_____																																												
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9. Listed sources of carbon monoxide poisoning -		_____	_____																																												
10. Listed sources of potential hazards while servicing automatic transmissions -		_____	_____																																												
Criteria: Competence in this task will be recognized when all achievement indicators are performed according to the supervisor's directions.																																															
Tools and Equipment:		Resources:																																													

Duty: Practicing Automotive Safety		Duty No. A																																													
		Task No. 21																																													
Task: Review safety rules for heating and air conditioning to become aware of potential hazards while working on a vehicle.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Listed personal safety rules -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Listed safety rules for power and hand tool use -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Listed safety rules for equipment used in servicing -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Listed sources of potential electrical shock -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5. Listed sources of potential fire hazards -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6. Listed sources of potential burns from heat and chemicals -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7. Listed sources of potential cuts and bruises -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>8. Listed methods of providing proper ventilation -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>9. Listed sources of carbon monoxide poisoning -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>10. Listed sources of potential hazards while working on the heating and cooling system -</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Listed personal safety rules -				2. Listed safety rules for power and hand tool use -				3. Listed safety rules for equipment used in servicing -				4. Listed sources of potential electrical shock -				5. Listed sources of potential fire hazards -				6. Listed sources of potential burns from heat and chemicals -				7. Listed sources of potential cuts and bruises -				8. Listed methods of providing proper ventilation -				9. Listed sources of carbon monoxide poisoning -				10. Listed sources of potential hazards while working on the heating and cooling system -			
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Criteria: Competence in this task will be recognized when all achievement indicators are performed according to the supervisor's directions.																																															
Tools and Equipment:	Resources:																																														

Duty: Practicing Automotive Safety		Duty No. A	
		Task No. 22	
Task: Review safety rules for servicing the cooling system to become aware of potential hazards while working on a vehicle.			
Achievement Indicators:		The learner:	
		Yes	No
1. Listed personal safety rules -		_____	_____
2. Listed safety rules for power and hand tools use -		_____	_____
3. Listed safety rules for equipment used in servicing the cooling system -		_____	_____
4. Listed sources of potential electrical shock -		_____	_____
5. Listed sources of potential fire hazards -		_____	_____
6. Listed sources of potential burns from heat and chemicals -		_____	_____
7. Listed sources of potential cuts and bruises -		_____	_____
8. Listed methods of providing proper ventilation -		_____	_____
9. Listed sources of carbon monoxide poisoning -		_____	_____
10. Listed sources of potential hazards while servicing cooling systems -		_____	_____
Criteria: Competence in this task will be recognized when all achievement indicators are performed according to the supervisor's directions.			
Tools and Equipment:		Resources:	

Duty: Practicing Automotive Safety		Duty No. A																					
		Task No. 23																					
Task: Learn safety rules on general shop safety to become aware of potential hazards while working in the automotive lab.																							
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3. Completed a safety inspection check list -		_____	_____																				
4. Made recommendations as to improve safety conditions -		_____	_____																				
Criteria: Competence in this task is recognized when all achievement indicators are performed according to the supervisor's directions.																							
Tools and Equipment:		Resources:																					

Duty: Practicing Automotive Safety		Duty No. A																													
		Task No. 24																													
Task: Conduct individual student shop safety inspection to become aware of potential hazards that may exist in the automotive lab.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Obtained safety inspection report -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Completed section on general physical condition -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Completed section on housekeeping -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Completed section on equipment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Completed section on electrical installation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Read section on personal safety -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Obtained safety inspection report -		_____	_____	2. Completed section on general physical condition -		_____	_____	3. Completed section on housekeeping -		_____	_____	4. Completed section on equipment -		_____	_____	5. Completed section on electrical installation -		_____	_____	6. Read section on personal safety -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and inspection sheet is completed and turned in.																															
Tools and Equipment:		Resources:																													

Duty: Practicing Shop Related Skills		Duty No. B																																									
		Task No. 1																																									
Task: Raise a vehicle to working height with a floor hoist.																																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Centered vehicle on hoist with wheel, or wheels in proper position on the hoist -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Adjusted swing arms and lift pads if needed so they were in position under the lift points on the vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Adjusted front hoist so it was positioned under the front lift point of the vehicle (in the case of twin post bay lift) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Slowly raised hoist until most of the vehicle's weight was off the wheels -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected hoist contact points to see if they had not moved and were in their proper positions -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Continued raising vehicle until maximum height was reached -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Lowered vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Lowered pads and retracted lift arms -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Removed vehicle from work area without hitting or dragging on the hoist -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Centered vehicle on hoist with wheel, or wheels in proper position on the hoist -		_____	_____	2. Adjusted swing arms and lift pads if needed so they were in position under the lift points on the vehicle -		_____	_____	3. Adjusted front hoist so it was positioned under the front lift point of the vehicle (in the case of twin post bay lift) -		_____	_____	4. Slowly raised hoist until most of the vehicle's weight was off the wheels -		_____	_____	5. Inspected hoist contact points to see if they had not moved and were in their proper positions -		_____	_____	6. Continued raising vehicle until maximum height was reached -		_____	_____	7. Lowered vehicle -		_____	_____	8. Lowered pads and retracted lift arms -		_____	_____	9. Removed vehicle from work area without hitting or dragging on the hoist -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the vehicle is properly placed on the hoist, hoist is adjusted and vehicle is safely raised to working height.																																											
Tools and Equipment: Vehicle, floor hoist		Resources:																																									

Duty: Practicing Shop Related Skills		Duty No. 8																																	
		Task No. 2																																	
Task: Raise a vehicle with a floor jack and support with safety stands.																																			
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Positioned vehicle in center of work area -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Selected a jack with adequate capacity to safely lift your project vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Positioned jack under a lifting point, sometimes called hard points -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Used caution that the jack was not placed under the oil pan, radiator support or radiator, transmission, floor pan, or fuel tank of vehicle as damage to the vehicle might result -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Raised vehicle to working height -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Placed telescoping safety stands under proper support points on vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Lowered jack until vehicle rested on the stands and the jack could be removed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Positioned vehicle in center of work area -		_____	_____	2. Selected a jack with adequate capacity to safely lift your project vehicle -		_____	_____	3. Positioned jack under a lifting point, sometimes called hard points -		_____	_____	4. Used caution that the jack was not placed under the oil pan, radiator support or radiator, transmission, floor pan, or fuel tank of vehicle as damage to the vehicle might result -		_____	_____	5. Raised vehicle to working height -		_____	_____	6. Placed telescoping safety stands under proper support points on vehicle -		_____	_____	7. Lowered jack until vehicle rested on the stands and the jack could be removed -		_____	_____
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7. Lowered jack until vehicle rested on the stands and the jack could be removed -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and vehicle is safely supported by the safety stands and ready for under vehicle work.																																			
Tools and Equipment: Vehicle, floor jack Safety stands		Resources:																																	

Duty: Practicing Shop Related Skills		Duty No. B																					
		Task No. 3																					
Task: Properly operate transmission jack to safely support and remove or install a transmission from a vehicle.																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Inspected jack, was sure it had the proper mounting brackets, lift pads and safety chain in place, raised and descended freely, rolled easily -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Placed jack under transmission and attached mounting brackets, or adjusted lift pads and used the safety chain -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Raised transmission and removed necessary fasteners -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Lowered transmission and rolled it out from underneath the vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Inspected jack, was sure it had the proper mounting brackets, lift pads and safety chain in place, raised and descended freely, rolled easily -		_____	_____	2. Placed jack under transmission and attached mounting brackets, or adjusted lift pads and used the safety chain -		_____	_____	3. Raised transmission and removed necessary fasteners -		_____	_____	4. Lowered transmission and rolled it out from underneath the vehicle -		_____	_____
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4. Lowered transmission and rolled it out from underneath the vehicle -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the transmission is safely removed from the vehicle.																							
Tools and Equipment: Vehicle with automatic or manual transmission; Transmission jack; Lifting devices; Necessary hand tools	Resources:																						

Duty: Practicing Shop Related Skills		Duty No. B																																													
		Task No. 4																																													
Task: Drill hole to size.																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Identified workpiece material and cutting speed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Selected speed for various drills used -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Selected holding device -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Secured work in holding device and checked for rigidity -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Aligned workpiece and center drill -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Determined hole size -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Selected and mounted drill -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Determined speed of drill -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Drilled dimensions (lubricated, if applicable) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Deburred hole -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Identified workpiece material and cutting speed -		_____	_____	2. Selected speed for various drills used -		_____	_____	3. Selected holding device -		_____	_____	4. Secured work in holding device and checked for rigidity -		_____	_____	5. Aligned workpiece and center drill -		_____	_____	6. Determined hole size -		_____	_____	7. Selected and mounted drill -		_____	_____	8. Determined speed of drill -		_____	_____	9. Drilled dimensions (lubricated, if applicable) -		_____	_____	10. Deburred hole -		_____	_____
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7. Selected and mounted drill -		_____	_____																																												
8. Determined speed of drill -		_____	_____																																												
9. Drilled dimensions (lubricated, if applicable) -		_____	_____																																												
10. Deburred hole -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																																															
Tools and Equipment: Drill press Drill bits		Resources: 																																													

Duty: Practicing Shop Related Skills		Duty No. B																																													
		Task No. 5																																													
Task: Tap threads using appropriate equipment to cut threads.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Selected the size and thread of the proposed fastener -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Selected the proper diameter tap drill for the diameter and pitch tap to be used -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Center punched a starting point in the workpiece -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Drilled the workpiece, used cutting oil -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Started tap in workpiece, used cutting oil -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Ran tap completely through workpiece, reversing tap direction occasionally to cut chips, used cutting oil -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Reversed direction and removed tap -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>8. Thoroughly cleaned threads -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>9. Installed fastener (bolt) and flat washer -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>10. Torqued fastener to S.A.E. recommended tension for the size and thread used in this project -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Selected the size and thread of the proposed fastener -		☐	☐	2. Selected the proper diameter tap drill for the diameter and pitch tap to be used -		☐	☐	3. Center punched a starting point in the workpiece -		☐	☐	4. Drilled the workpiece, used cutting oil -		☐	☐	5. Started tap in workpiece, used cutting oil -		☐	☐	6. Ran tap completely through workpiece, reversing tap direction occasionally to cut chips, used cutting oil -		☐	☐	7. Reversed direction and removed tap -		☐	☐	8. Thoroughly cleaned threads -		☐	☐	9. Installed fastener (bolt) and flat washer -		☐	☐	10. Torqued fastener to S.A.E. recommended tension for the size and thread used in this project -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the fastener turns easily. The tapped threads must stand up to torque application.																																															
Tools and Equipment: Electric drill: Tap drills; Taps; Workpiece; Tap chart; Cutting oil	Resources:																																														

Duty: Practicing Shop Related Skills		Duty No. 8																																					
		Task No. 6																																					
Task: Remove broken stud using appropriate equipment to remove a broken stud and restore proper thread condition.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Center punched the stud -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Drilled small pilot hole into the stud -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Selected proper drill size for extractor used -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Drilled larger hole in the stud -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Inserted extractor and turned counter clockwise -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Removed broken stud -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Inspected thread condition -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>8. Repaired if necessary -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Center punched the stud -		☐	☐	2. Drilled small pilot hole into the stud -		☐	☐	3. Selected proper drill size for extractor used -		☐	☐	4. Drilled larger hole in the stud -		☐	☐	5. Inserted extractor and turned counter clockwise -		☐	☐	6. Removed broken stud -		☐	☐	7. Inspected thread condition -		☐	☐	8. Repaired if necessary -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																																							
Tools and Equipment: Drill motor Drill bits Extractors	Resources:																																						

Duty: Practicing Shop Related Skills		Duty No. B																					
		Task No. 7																					
Task: Cut with a hacksaw using appropriate equipment cut material with a hacksaw.																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Selected correct size blade -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Mounted blade into the frame -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Secured work piece -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Sawed workpiece to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Selected correct size blade -		_____	_____	2. Mounted blade into the frame -		_____	_____	3. Secured work piece -		_____	_____	4. Sawed workpiece to specifications -		_____	_____
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4. Sawed workpiece to specifications -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																							
Tools and Equipment: Hacksaw Assorted blades Vice	Resources:																						

Duty: Practicing Shop Related Skills		Duty No. 8																									
		Task No. 8																									
Task: Cut with a cold chisel using appropriate equipment, cut a piece of flat metal with a cold chisel.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Marked the metal to be cut -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Secured material in a vice -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Selected proper size chisel and hammer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Held chisel at 30° angle from the line of cut -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Cut the metal -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Marked the metal to be cut -		_____	_____	2. Secured material in a vice -		_____	_____	3. Selected proper size chisel and hammer -		_____	_____	4. Held chisel at 30° angle from the line of cut -		_____	_____	5. Cut the metal -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																											
Tools and Equipment:		Resources:																									

Duty: Practicing Shop Related Skills

Duty No. 8

Task No. 9

Task: Draw file a flat surface to restore a warped or damaged surface.

Achievement Indicators:

The learner:

Yes No

- | | | |
|---|-------|-------|
| 1. Secured stock to be filed - | _____ | _____ |
| 2. Selected proper size machinists file - | _____ | _____ |
| 3. Draw filed crosswise over the work with light pressure - | _____ | _____ |
| 4. Cut in both directions - | _____ | _____ |
| 5. Checked surface for true - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.

Tools and Equipment:

Vice
Machinists files

Resources:

Duty: Practicing Shop Related Skills		Duty No. B																																									
		Task No. 10																																									
Task: Set up of oxy-acetylene torch and assemble all components so torch is ready for operation, following all safety procedures.																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Checked safety caps on cylinders before moving -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked cart for safety chains, and any defects that could cause it to tip -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Installed cylinder in cart, with proper safety chain attachment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed safety cover from oxygen cylinder and installed pressure regulator, making sure the pressure adjustment screw was turned completely out -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed safety cover from acetylene cylinder and installed pressure regulator, making sure the pressure adjustment screw was turned completely out -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Inspected hoses for cuts, kinks, burns or defects that could cause leaking -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed hoses on regulators; red to acetylene, and green to oxygen -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Attached hoses to welding torch handle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Checked striker for operation, replaced flint if needed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Checked safety caps on cylinders before moving -		_____	_____	2. Checked cart for safety chains, and any defects that could cause it to tip -		_____	_____	3. Installed cylinder in cart, with proper safety chain attachment -		_____	_____	4. Removed safety cover from oxygen cylinder and installed pressure regulator, making sure the pressure adjustment screw was turned completely out -		_____	_____	5. Removed safety cover from acetylene cylinder and installed pressure regulator, making sure the pressure adjustment screw was turned completely out -		_____	_____	6. Inspected hoses for cuts, kinks, burns or defects that could cause leaking -		_____	_____	7. Installed hoses on regulators; red to acetylene, and green to oxygen -		_____	_____	8. Attached hoses to welding torch handle -		_____	_____	9. Checked striker for operation, replaced flint if needed -		_____	_____
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9. Checked striker for operation, replaced flint if needed -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's direction and the oxy-acetylene equipment is set-up and ready to operate.																																											
Tools and Equipment: Oxy-acetylene welding equipment, with cart	Resources:																																										

Duty: Practicing Shop Related Skills

Duty No. B

Task No. 11

Task: Light oxy-acetylene torch.

Achievement Indicators:

The learner:

Yes No

1. Visually inspected welding equipment for proper set-up and corrected any safety defects -
2. Checked pressure regulator adjustment screws to assure they were completely released -
3. Installed torch tip of proper size -
4. Slowly opened both oxygen and acetylene cylinders -
5. Adjusted pressure regulators to desired pressure -
6. Keeping the tip pointed downward and away from the operator, slightly opened the acetylene valve and lit the gas with a striker -
7. Slowly opened the oxygen valve until the flame changed from yellow to blue -
8. Viewed flame through smoked welding goggles until the three flame components could be identified -
9. Continued turning the oxygen valve until the secondary flame disappeared completely -
10. Demonstrated a neutral flame just at the point when the secondary flame disappeared -

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the torch can be lit and adjusted to a neutral flame.

Tools and Equipment:

Oxy-acetylene welding equipment and safety equipment

Resources:

Duty: Practicing Shop Related Skills		Duty No. B																																	
		Task No. 12																																	
Task: Cut metal with oxy-acetylene torch using appropriate equipment to cut a clean and even cut.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Placed workpiece on welding bench, or bench vice assuring an open space underneath it to receive cutting flames and slag -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Installed cutting head on torch -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Opened tanks and adjusted regulators to proper pressure -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Lighted torch and adjusted to neutral flame -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Heated workpiece at edge until molten -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Depressed cutting handle and continued moving across workpiece -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Practiced until you could produce clean, even cuts -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Placed workpiece on welding bench, or bench vice assuring an open space underneath it to receive cutting flames and slag -		☐	☐	2. Installed cutting head on torch -		☐	☐	3. Opened tanks and adjusted regulators to proper pressure -		☐	☐	4. Lighted torch and adjusted to neutral flame -		☐	☐	5. Heated workpiece at edge until molten -		☐	☐	6. Depressed cutting handle and continued moving across workpiece -		☐	☐	7. Practiced until you could produce clean, even cuts -		☐	☐
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7. Practiced until you could produce clean, even cuts -		☐	☐																																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and you can produce clean, even cuts following a line or contour on the workpiece.																																			
Tools and Equipment: Oxy-acetylene welding equipment; Workpiece; Welding bench; Cutting head; Straight edge; Soapstone or chalk	Resources:																																		

Duty: Practicing Shop Related Skills		Duty No. B																													
		Task No. 13																													
Task: Puddle weld two metal workpieces using appropriate equipment to weld two metal workpieces together.																															
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6. Practiced until a continuous weld of at least three inches was performed -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the welds show continuous movement, no burn throughs, and can withstand minor destructive testing.																															
Tools and Equipment: Oxy-acetylene welding equipment; Welding bench; Metal workpieces		Resources:																													

Duty: Practicing Shop Related Skills		Duty No. 8																																	
		Task No. 14																																	
Task: Join metal by braze welding using appropriate equipment to braze weld two pieces of metal.																																			
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Placed workpiece so edges overlapped on welding bench -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Selected tip, opened tanks, adjusted regulators -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Lighted torch and adjusted to neutral flame -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Heated workpieces until the metal just began to glow -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Melted a small amount of bronze rod and let it spread over joint to tin the surface -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Carried the graze up the joint adding filler rod using a slightly circular motion of the torch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Practiced until braze welds were of equal width and height -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Placed workpiece so edges overlapped on welding bench -		_____	_____	2. Selected tip, opened tanks, adjusted regulators -		_____	_____	3. Lighted torch and adjusted to neutral flame -		_____	_____	4. Heated workpieces until the metal just began to glow -		_____	_____	5. Melted a small amount of bronze rod and let it spread over joint to tin the surface -		_____	_____	6. Carried the graze up the joint adding filler rod using a slightly circular motion of the torch -		_____	_____	7. Practiced until braze welds were of equal width and height -		_____	_____
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7. Practiced until braze welds were of equal width and height -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the braze welds are of uniform width and height, with fine ripples and free of pits.																																			
Tools and Equipment: Oxy-acetylene welding equipment; Workpieces; Brazing rod; Welding bench		Resources:																																	

Duty: Practicing Shop Related Skills		Duty No. B																	
		Task No. 15																	
Task: Use specification manuals to become familiar with specifications used in the repair of motor vehicles.																			
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Obtained a specification worksheet -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Obtained the proper car repair manual -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Completed the specification worksheet on a particular vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Obtained a specification worksheet -		_____	_____	2. Obtained the proper car repair manual -		_____	_____	3. Completed the specification worksheet on a particular vehicle -		_____	_____
Achievement Indicators:	The learner:	Yes	No																
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2. Obtained the proper car repair manual -		_____	_____																
3. Completed the specification worksheet on a particular vehicle -		_____	_____																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																			
Tools and Equipment: Repair manuals	Resources:																		

Duty: Practicing Shop Related Skills		Duty No. B																					
		Task No. 16																					
Task: Use parts and time guides to become familiar with parts and labor charges.																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Obtained parts and time guides -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Listed all parts, numbers and prices for a minor tune-up on a particular vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Listed flat rate time for completing a minor tune-up on a particular vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Computed total cost of parts and labor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Obtained parts and time guides -		_____	_____	2. Listed all parts, numbers and prices for a minor tune-up on a particular vehicle -		_____	_____	3. Listed flat rate time for completing a minor tune-up on a particular vehicle -		_____	_____	4. Computed total cost of parts and labor -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																							
Tools and Equipment:	Resources:																						

Duty: Practicing Shop Related Skills		Duty No. B	
		Task No. 17	
Task: Use the outside micrometer using the appropriate equipment to measure several selected pieces of metal to within .001 of an inch.			
Achievement Indicators:	The learner:	Yes	No
1. Selected workpieces to be measured -		_____	_____
2. Selected the proper size micrometer -		_____	_____
3. Cleaned the spindle and anril of the micrometer -		_____	_____
4. Checked micrometer at zero reference -		_____	_____
5. Measured the workpieces -		_____	_____
6. Listed the readings -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.			
Tools and Equipment: Micrometer Round stock		Resources:	

Duty: Practicing Shop Related Skills		Duty No. B																																													
		Task No. 18																																													
Task: Check and recharge battery using appropriate equipment to charge batteries.																																															
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; width: 40%;">Achievement Indicators:</th> <th style="text-align: left; width: 30%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> <tr> <td>1. Inspected battery for obvious defects, cracks, excessive dirt, breezing, low electrolyte -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Added water if needed -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Cleaned battery if needed -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Tested specific gravity of electrolyte using temperature correction chart to determine percent of charge -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Checked the battery charger to be certain it was turned off -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Connected charger to battery, + to +; - to -, and were certain the connections were correct -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Selected charging rate and turned on charger -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Allowed charger to operate for predetermined time -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Turned off charger -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Retested specific gravity of electrolyte to determine when battery was fully charged -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Inspected battery for obvious defects, cracks, excessive dirt, breezing, low electrolyte -		_____	_____	2. Added water if needed -		_____	_____	3. Cleaned battery if needed -		_____	_____	4. Tested specific gravity of electrolyte using temperature correction chart to determine percent of charge -		_____	_____	5. Checked the battery charger to be certain it was turned off -		_____	_____	6. Connected charger to battery, + to +; - to -, and were certain the connections were correct -		_____	_____	7. Selected charging rate and turned on charger -		_____	_____	8. Allowed charger to operate for predetermined time -		_____	_____	9. Turned off charger -		_____	_____	10. Retested specific gravity of electrolyte to determine when battery was fully charged -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																												
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10. Retested specific gravity of electrolyte to determine when battery was fully charged -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the battery has been recharged to 1.280 corrected specific gravity.																																															
Tools and Equipment: Battery; Hydrometer; Temperature correction chart; Battery charger		Resources: 																																													

Duty: Practicing Shop Related Skills	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">B</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">19</td> </tr> </table>	Duty No.	B	Task No.	19																																																				
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Task No.	19																																																								
Task: Jump start a vehicle with a dead battery using appropriate equipment to start a car with a dead battery.																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 45%; text-align: left; padding: 5px;">Achievement Indicators:</th> <th style="width: 20%; text-align: left; padding: 5px;">The learner:</th> <th style="width: 10%; text-align: center; padding: 5px;">Yes</th> <th style="width: 10%; text-align: center; padding: 5px;">No</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">1. Placed running vehicle near front of the disabled vehicle -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">2. Opened both hoods -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">3. Located positive and negative battery terminals on both vehicles -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">4. Was certain beyond any doubt you knew the polarity of each terminal before making the jumper connections as electrical damage to the vehicles could occur -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">5. Connected one end of the red jumper cable to positive (+) battery terminal on the disabled vehicle -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">6. Connected one end of the green jumper cable to a good ground on the engine block or the negative (-) battery terminal of the disabled vehicle -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">7. Connected the remaining end of the red jumper cable to the positive (+) battery terminal of the good vehicle -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">8. Started and allowed to run the vehicle being used to jump the disabled vehicle -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">9. Connected remaining end of green cable to good ground on the engine block away from the battery -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">10. Allowed vehicles to remain in this configuration for a few minutes to help charge the dead battery -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">11. Started car with dead battery -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">12. Removed jumper cables starting with one of the green or negative (-) cables first -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">13. Removed cables from the other three connections -</td> <td style="padding: 5px;"></td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> </tbody> </table>		Achievement Indicators:	The learner:	Yes	No	1. Placed running vehicle near front of the disabled vehicle -		_____	_____	2. Opened both hoods -		_____	_____	3. Located positive and negative battery terminals on both vehicles -		_____	_____	4. Was certain beyond any doubt you knew the polarity of each terminal before making the jumper connections as electrical damage to the vehicles could occur -		_____	_____	5. Connected one end of the red jumper cable to positive (+) battery terminal on the disabled vehicle -		_____	_____	6. Connected one end of the green jumper cable to a good ground on the engine block or the negative (-) battery terminal of the disabled vehicle -		_____	_____	7. Connected the remaining end of the red jumper cable to the positive (+) battery terminal of the good vehicle -		_____	_____	8. Started and allowed to run the vehicle being used to jump the disabled vehicle -		_____	_____	9. Connected remaining end of green cable to good ground on the engine block away from the battery -		_____	_____	10. Allowed vehicles to remain in this configuration for a few minutes to help charge the dead battery -		_____	_____	11. Started car with dead battery -		_____	_____	12. Removed jumper cables starting with one of the green or negative (-) cables first -		_____	_____	13. Removed cables from the other three connections -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																																						
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the disabled vehicle is started by following the correct procedures.

Tools and Equipment:

Vehicle with low or dead battery; Jumper cables;
Vehicle with a good battery or a fully charged jumper battery

Resources:

Duty: Practicing Shop Related Skills		Duty No. B																																	
		Task No. 20																																	
Task: Change crankcase oil using appropriate equipment to change crankcase oil.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Located car on hoist -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Drained oil into proper container -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Removed oil filter -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Cleaned drain plug and filter mounting -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Inspected gasket, replaced drain plug, oil filter gasket, and replaced filter according to directions on the filter -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Added oil to engine -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Started engine and checked for leaks -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Located car on hoist -		☐	☐	2. Drained oil into proper container -		☐	☐	3. Removed oil filter -		☐	☐	4. Cleaned drain plug and filter mounting -		☐	☐	5. Inspected gasket, replaced drain plug, oil filter gasket, and replaced filter according to directions on the filter -		☐	☐	6. Added oil to engine -		☐	☐	7. Started engine and checked for leaks -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions.																																			
Tools and Equipment:		Resources:																																	

Duty: Using Employability Skills		Duty No. C												
		Task No. 1												
Task: Investigate employment information using sources of employment information to identify employment opportunities.														
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Developed a list of the prime sources of information concerning opportunities for employment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Described special procedures, if any, required to utilize services, information, etc. -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Developed a list of the prime sources of information concerning opportunities for employment -		_____	_____	2. Described special procedures, if any, required to utilize services, information, etc. -		_____	_____
Achievement Indicators:	The learner:	Yes	No											
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Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.														
Tools and Equipment:	Resources:													

Duty: Using Employability Skills		Duty No. C								
		Task No. 2								
Task: Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Listed the significant requirements (health, physical, legal, education, etc.) of the appropriate occupation - </td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Listed the significant requirements (health, physical, legal, education, etc.) of the appropriate occupation -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Listed the significant requirements (health, physical, legal, education, etc.) of the appropriate occupation -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C									
		Task No. 3									
Task: Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.											
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Listed the approximate entry wages, general wage range, and significant fringe benefits for the appropriate occupation - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Compared these wages and fringe benefits with other selected occupations - </td> <td> _____ </td> <td> _____ </td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Listed the approximate entry wages, general wage range, and significant fringe benefits for the appropriate occupation -	_____	_____	2. Compared these wages and fringe benefits with other selected occupations -	_____	_____
Achievement Indicators: The learner:	Yes	No									
1. Listed the approximate entry wages, general wage range, and significant fringe benefits for the appropriate occupation -	_____	_____									
2. Compared these wages and fringe benefits with other selected occupations -	_____	_____									
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.											
Tools and Equipment:	Resources:										

Duty: Using Employability Skills		Duty No. C								
		Task No. 4								
Task: Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Listed and described the significant non-wage characteristics (e.g., shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment, etc.) - </td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Listed and described the significant non-wage characteristics (e.g., shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment, etc.) -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Listed and described the significant non-wage characteristics (e.g., shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment, etc.) -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C								
		Task No. 5								
Task: Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2">1. Described the local, regional, and national employment opportunities for the appropriate occupation -</td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Described the local, regional, and national employment opportunities for the appropriate occupation -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Described the local, regional, and national employment opportunities for the appropriate occupation -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C									
		Task No. 6									
Task: Analyze career ladder using available resources to describe job progression in an occupation.											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Described the career ladder associated with the appropriate occupational area - </td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Described the career ladder associated with the appropriate occupational area -		_____	_____
Achievement Indicators:	The learner:	Yes	No								
1. Described the career ladder associated with the appropriate occupational area -		_____	_____								
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.											
Tools and Equipment:	Resources:										

Duty: Using Employability Skills		Duty No. C									
		Task No. 7									
Task: Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or other alternatives.											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Compared personal criteria with information about a job, further training or other alternatives - </td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Compared personal criteria with information about a job, further training or other alternatives -		_____	_____
Achievement Indicators:	The learner:	Yes	No								
1. Compared personal criteria with information about a job, further training or other alternatives -		_____	_____								
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.											
Tools and Equipment:		Resources:									

Duty: Using Employability Skills		Duty No. C									
		Task No. 8									
Task: Prepare a resume using personal information to apply for a job.											
<table border="0"> <tr> <td> Achievement Indicators: </td> <td> The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td colspan="2"> 1. Prepared a resume - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Prepared a resume -		_____	_____
Achievement Indicators:	The learner:	Yes	No								
1. Prepared a resume -		_____	_____								
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.											
Tools and Equipment:		Resources:									

Duty: Using Employability Skills		Duty No. C								
		Task No. 9								
Task: Write a letter of application using personal notes to apply/inquire about a job.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2">1. Wrote a letter of application/inquiry -</td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Wrote a letter of application/inquiry -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Wrote a letter of application/inquiry -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C								
		Task No. 10								
Task: Complete a job application using personal notes to apply for a job.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Completed a job application -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Completed a job application -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Completed a job application -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C																									
		Task No. 11																									
Task: Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.																											
<table border="0"> <tr> <td>Achievement indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="4"> 1. Described and/or dressed in the attire of the appropriate occupational area, including: </td> </tr> <tr> <td>a. grooming -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>b. required health and safety equipment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>c. uniforms -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>d. other _____ -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement indicators:	The learner:	Yes	No	1. Described and/or dressed in the attire of the appropriate occupational area, including:				a. grooming -		_____	_____	b. required health and safety equipment -		_____	_____	c. uniforms -		_____	_____	d. other _____ -		_____	_____
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b. required health and safety equipment -		_____	_____																								
c. uniforms -		_____	_____																								
d. other _____ -		_____	_____																								
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.																											
Tools and Equipment:	Resources:																										

Duty: Using Employability Skills		Duty No. C																									
		Task No. 12																									
Task: Complete a job interview using communication and interpersonal skills to become employed.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Described and/or demonstrated appropriate characteristics for job applicants including:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>a. attire -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>b. grooming -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>c. conduct during the interview -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Describe and/or demonstrated the interview process -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Described and/or demonstrated appropriate characteristics for job applicants including:				a. attire -		_____	_____	b. grooming -		_____	_____	c. conduct during the interview -		_____	_____	2. Describe and/or demonstrated the interview process -		_____	_____
Achievement Indicators:	The learner:	Yes	No																								
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b. grooming -		_____	_____																								
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Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.																											
Tools and Equipment:	Resources:																										

Duty: Using Employability Skills		Duty No. C								
		Task No. 13								
Task: Describe personal criteria using references to identify acceptable job offers.										
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Listed personal criteria (financial, social, etc.) which described a job offer -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Listed personal criteria (financial, social, etc.) which described a job offer -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Listed personal criteria (financial, social, etc.) which described a job offer -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C								
		Task No. 14								
Task: Demonstrate interpersonal skills to achieve successful relationships with others.										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Identified probable causes for conflicts and at least one possible action to relieve the conflict - </td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Identified probable causes for conflicts and at least one possible action to relieve the conflict -		_____	_____
Achievement Indicators:	The learner:	Yes	No							
1. Identified probable causes for conflicts and at least one possible action to relieve the conflict -		_____	_____							
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.										
Tools and Equipment:	Resources:									

Duty: Using Employability Skills		Duty No. C									
		Task No. 16									
Task: Describe job termination procedures using a knowledge of the occupational area to leave a particular job.											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2"> 1. Described procedures and practices for terminating a job - </td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Described procedures and practices for terminating a job -		_____	_____
Achievement Indicators:	The learner:	Yes	No								
1. Described procedures and practices for terminating a job -		_____	_____								
Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.											
Tools and Equipment:	Resources:										

Duty: Practicing Michigan Auto Repair Act		Duty No. D																					
		Task No. 1																					
Task: Review motor vehicle repair act using appropriate information to provide the learner with a basic knowledge of the repair act.																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Reviewed facility registration rules -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Reviewed facility operation requirements -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Reviewed mechanic certification requirements -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Reviewed consumers rights -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Reviewed facility registration rules -		_____	_____	2. Reviewed facility operation requirements -		_____	_____	3. Reviewed mechanic certification requirements -		_____	_____	4. Reviewed consumers rights -		_____	_____
Achievement Indicators:	The learner:	Yes	No																				
1. Reviewed facility registration rules -		_____	_____																				
2. Reviewed facility operation requirements -		_____	_____																				
3. Reviewed mechanic certification requirements -		_____	_____																				
4. Reviewed consumers rights -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and has reviewed information regarding the motor vehicle service and repair act.																							
Tools and Equipment:		Resources:																					

Duty: Practicing Michigan Auto Repair Act		Duty No. D																																									
		Task No. 2																																									
Task: Prepare written estimate using the appropriate form to provide the consumer with a written estimate for repair.																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Received sample estimate sheet -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Listed repair facility number -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Provided a clear statement of work to be performed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Estimated labor time (in hours) the work will take -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Estimated price of labor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Listed parts needed to complete estimated work -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Listed cost of the parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Listed total of labor and parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Obtained customer's signature -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Received sample estimate sheet -		_____	_____	2. Listed repair facility number -		_____	_____	3. Provided a clear statement of work to be performed -		_____	_____	4. Estimated labor time (in hours) the work will take -		_____	_____	5. Estimated price of labor -		_____	_____	6. Listed parts needed to complete estimated work -		_____	_____	7. Listed cost of the parts -		_____	_____	8. Listed total of labor and parts -		_____	_____	9. Obtained customer's signature -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																								
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8. Listed total of labor and parts -		_____	_____																																								
9. Obtained customer's signature -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and completed a written estimate of repair according to the motor vehicle service and repair act.																																											
Tools and Equipment:		Resources:																																									

Duty: Practicing Michigan Auto Repair Act		Duty No. D																													
		Task No. 3																													
Task: Prepare a waiver of estimate using the appropriate form to comply with the Michigan Auto Repair Act.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Reviewed circumstances relating to waiver or an estimate -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Received waiver of estimate form -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Obtained the customer's signature -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Listed total cost under stated amount -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Obtained motor vehicle description -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Recorded date and time -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Reviewed circumstances relating to waiver or an estimate -		_____	_____	2. Received waiver of estimate form -		_____	_____	3. Obtained the customer's signature -		_____	_____	4. Listed total cost under stated amount -		_____	_____	5. Obtained motor vehicle description -		_____	_____	6. Recorded date and time -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and completed a waiver of estimate form according to the Motor Vehicle Service and Repair Act.																															
Tools and Equipment:		Resources:																													

Duty: Practicing Michigan Auto Repair Act		Duty No. D																																	
		Task No. 4																																	
Task: Prepare a final bill using the appropriate form to provide the consumer with a final bill.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Received sample final bill -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Listed description and price of all parts (stated if parts were used, rebuilt or reconditioned) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Stated actual price of labor for work performed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Stated total labor charged -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Stated all work performed for which there is a charge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Obtained signature of authorized representative of repair facility -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Obtained the name and certificate number of the mechanic or mechanics who performed the major repairs -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Received sample final bill -		_____	_____	2. Listed description and price of all parts (stated if parts were used, rebuilt or reconditioned) -		_____	_____	3. Stated actual price of labor for work performed -		_____	_____	4. Stated total labor charged -		_____	_____	5. Stated all work performed for which there is a charge -		_____	_____	6. Obtained signature of authorized representative of repair facility -		_____	_____	7. Obtained the name and certificate number of the mechanic or mechanics who performed the major repairs -		_____	_____
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Tools and Equipment:		Resources:																																	

Duty: Practicing Michigan Auto Repair Act		Duty No. D																	
		Task No. 5																	
Task: Review mechanic certification using the appropriate information to provide the learner with a basic knowledge of mechanic certification.																			
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and has reviewed section on mechanic certification according to the Motor Vehicle Service and Repair Act.																			
Tools and Equipment:		Resources:																	

Duty: Practicing Michigan Auto Repair Act		Duty No. D												
		Task No. 6												
Task: Prepare mechanic test registration form using appropriate form to provide the learner an opportunity to fill the form out correctly.														
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Obtained test registration form -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Completed all parts of the form -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Obtained test registration form -		_____	_____	2. Completed all parts of the form -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and the form is filled out correctly.														
Tools and Equipment:		Resources:												

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																																																					
		Task No. 1																																																					
Task: Replace spark plugs using appropriate equipment to restore spark plug operation.																																																							
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and spark plugs are replaced according to manufacturer's specifications.																																																							
Tools and Equipment: Basic Tool Set Torque Wrench		Resources:																																																					

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																									
		Task No. 2																									
Task: Gap spark plugs using appropriate equipment to set electrode gap.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for specifications and procedure to gap spark plugs -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Gapped each spark plug to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Bent side electrode to proper gap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked to be sure electrodes are parallel -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Rechecked spark plug gap with wire feeler gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for specifications and procedure to gap spark plugs -		_____	_____	2. Gapped each spark plug to specifications -		_____	_____	3. Bent side electrode to proper gap -		_____	_____	4. Checked to be sure electrodes are parallel -		_____	_____	5. Rechecked spark plug gap with wire feeler gauge -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and spark plugs are gapped to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set Spark Plug Gauge		Resources:																									

Duty: Certification: Engine Tune-up		Duty No. E																																									
		Task No. 3																																									
Task: Clean spark plugs using appropriate equipment to remove all carbon from electrode insulator and shell.																																											
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Tools and Equipment: Basic Tool Set		Resources:																																									

Duty: Certification: Engine Tune-up (Ignition System)	Duty No. E																																																				
Task: Replace ignition points using appropriate equipment to restore point operation.																																																					
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and ignition points are replaced according to manufacturer's specifications.

Tools and Equipment:

Resources:

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 5	
Task: Replace condenser using appropriate equipment to restore condenser operation.			
Achievement Indicators:	The learner:	Yes	No
1. Raised hood of car and carefully removed distributor cap -			
2. Loosened lead screw and detached lead from contact set -			
3. Removed condenser -			
4. Wiped breaker plate clean and oil lever post (if necessary) -			
5. Installed new condenser attached leads -			
6. Tightened all screws -			
7. Lubricated distributor as specified and reassembled distributor cap to base -			
8. Turned engine on to performance test points and condenser -			
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and condenser is replaced according to manufacturer's specifications.			
Tools and Equipment:	Resources:		
Basic Tool Set			

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																																	
		Task No. 6																																	
Task: Test condenser using appropriate equipment to detect any deviation from manufacturer's specifications.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for specifications on testing a condenser -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked leak on condenser for looseness -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Tested for leakage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Tested for series resistance -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Tested for capacitance record value -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Compared readings with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced condenser if readings do not compare to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for specifications on testing a condenser -		_____	_____	2. Checked leak on condenser for looseness -		_____	_____	3. Tested for leakage -		_____	_____	4. Tested for series resistance -		_____	_____	5. Tested for capacitance record value -		_____	_____	6. Compared readings with manufacturer's specifications -		_____	_____	7. Replaced condenser if readings do not compare to specifications -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and condensor is tested to detect any deviation from manufacturer's specifications according to manufacturer's specifications.																																			
Tools and Equipment: Condenser Tester		Resources:																																	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E									
				Task No. 7							
Task: Test point dwell using appropriate equipment to detect point dwell deviating from manufacturer's specifications.											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="4"> 1. Referred to manufacturer's repair manual to obtain dwell - _____ 2. Calibrated dwell meter - _____ 3. Connected dwell meter to engine - _____ 4. Read indicated dwell at idle and while accelerating - _____ 5. Compared indicated dwell with specifications - _____ </td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual to obtain dwell - _____ 2. Calibrated dwell meter - _____ 3. Connected dwell meter to engine - _____ 4. Read indicated dwell at idle and while accelerating - _____ 5. Compared indicated dwell with specifications - _____			
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1. Referred to manufacturer's repair manual to obtain dwell - _____ 2. Calibrated dwell meter - _____ 3. Connected dwell meter to engine - _____ 4. Read indicated dwell at idle and while accelerating - _____ 5. Compared indicated dwell with specifications - _____											
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions, and the dwell is tested.											
Tools and Equipment: Dwell Meter		Resources:									

Duty: Certification: Engine Tune-up (Ignition)

Duty No. E

Task No. 8

Task: Adjust point dwell using appropriate equipment to restore point dwell within manufacturer's specifications.

Achievement Indicators:

The learner:

Yes

No

1. Referred to manufacturer's repair manual for specifications and procedure for adjusting point dwell - ☐ ☐
2. Connected tester leads according to meter instructions - ☐ ☐
3. Removed distributor cap and rotor (internal adjustment)- ☐ ☐
4. Connected remote starter switch - ☐ ☐
5. Turned ignition key on - ☐ ☐
6. Observed scope screen or meter while cranking engine - ☐ ☐
7. Compared with manufacturer's specifications - ☐ ☐
8. Adjusted point assembly until dwell is within specifications - ☐ ☐
9. Rechecked dwell measurement - ☐ ☐
10. Disconnected remote starter switch - ☐ ☐
11. Replaced distributor cap and rotor (internal adjustment)- ☐ ☐
12. Started engine - ☐ ☐
13. Compared measurement to specifications and readjusted if necessary - ☐ ☐

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and dwell is adjusted according to manufacturer's specifications.

Tools and Equipment:

Dwell Meter
Oscilloscope
Basic Tool Set

Resources:

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 9	
Task: Test spark plug wire using appropriate equipment to detect resistance outside manufacturer's specifications.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for specifications and procedure to test spark plug wire -		_____	_____
2. Removed distributor cap -		_____	_____
3. Removed spark plug wire from spark plug -		_____	_____
4. Measured resistance from cap terminal to spark plug terminal -		_____	_____
5. Compared reading with manufacturer's specifications -		_____	_____
6. Replaced any wire that did not meet manufacturer's specifications -		_____	_____
7. Replaced distributor cap and wires -		_____	_____
8. Performed secondary resistance test using oscilloscope if applicable -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and spark plug wire is tested to detect resistance beyond manufacturer's specifications according to manufacturer's specifications.			
Tools and Equipment: Ohmmeter Oscilloscope Basic Tool Set		Resources:	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																								
		Task No. 10																								
Task: Replace spark plug wires using appropriate equipment to restore spark plug wire operation.																										
Achievement Indicators:	The learner:	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">NO</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure to replace spark plug wires -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Removed one spark plug wire at a time -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Compared spark plug wire length to new wire -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Installed new wire -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Routed all wires according to manufacturer's specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Replaced all remaining wires -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Started engine to check wire installation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Yes	NO	1. Referred to manufacturer's repair manual for procedure to replace spark plug wires -	_____	_____	2. Removed one spark plug wire at a time -	_____	_____	3. Compared spark plug wire length to new wire -	_____	_____	4. Installed new wire -	_____	_____	5. Routed all wires according to manufacturer's specifications -	_____	_____	6. Replaced all remaining wires -	_____	_____	7. Started engine to check wire installation -	_____	_____
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Tools and Equipment: Basic Tool Set	Resources:																									

Duty: Certification: Engine Tune-up (Ignition)		Duty No. E																																																	
		Task No. 11																																																	
Task: Test secondary circuit continuity using appropriate equipment to detect resistance outside manufacturer's specifications.																																																			
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for specifications and procedure to test secondary circuit continuity -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Removed distributor cap -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Removed spark plug wire from spark plug -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Measured resistance from cap terminal to spark plug terminal -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Compared to manufacturer's specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Measured resistance in secondary winding of coil -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Compared to manufacturer's specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>8. Measured resistance in coil wire -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>9. Compared to manufacturer's specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>10. Performed secondary circuit resistance test (oscilloscope)-</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>11. Repaired or replaced any component that deviates from manufacturer's specification -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for specifications and procedure to test secondary circuit continuity -		☐	☐	2. Removed distributor cap -		☐	☐	3. Removed spark plug wire from spark plug -		☐	☐	4. Measured resistance from cap terminal to spark plug terminal -		☐	☐	5. Compared to manufacturer's specifications -		☐	☐	6. Measured resistance in secondary winding of coil -		☐	☐	7. Compared to manufacturer's specifications -		☐	☐	8. Measured resistance in coil wire -		☐	☐	9. Compared to manufacturer's specifications -		☐	☐	10. Performed secondary circuit resistance test (oscilloscope)-		☐	☐	11. Repaired or replaced any component that deviates from manufacturer's specification -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and secondary circuit continuity is tested according to manufacturer's specifications.																																																			
Tools and Equipment: Ohmmeter Oscilloscope		Resources: 																																																	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																																									
		Task No. 12																																									
Task: Test primary circuit using appropriate equipment to detect resistance outside manufacturer's specifications.																																											
<table border="0"> <thead> <tr> <th style="text-align: left;">Achievement Indicators:</th> <th style="text-align: left;">The learner:</th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for specifications and test procedure -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Performed voltage test and resistance test on the following:</td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. ignition switch -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> b. ignition resistor -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> c. ignition primary circuit wiring -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> d. ignition coil -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> e. ignition by-pass circuit -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Compared readings with specifications -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Repaired or replaced any defective component -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for specifications and test procedure -		_____	_____	2. Performed voltage test and resistance test on the following:				a. ignition switch -		_____	_____	b. ignition resistor -		_____	_____	c. ignition primary circuit wiring -		_____	_____	d. ignition coil -		_____	_____	e. ignition by-pass circuit -		_____	_____	3. Compared readings with specifications -		_____	_____	4. Repaired or replaced any defective component -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and primary circuit is tested according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set Voltmeter Ohmmeter		Resources:																																									

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E
		Task No. 13
Task: Test ignition coil using appropriate equipment to detect any deviation from manufacturer's specifications.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for specifications and procedure for testing coil -		_____
2. Performed coil test:		
a. measured primary and secondary coil resistance -		_____
b. connected coil to coil tester and performed coil test as indicated by tester manufacturer -		_____
c. performed coil output test with oscilloscope -		_____
3. Compared test results with specifications -		_____
4. Replaced defective coil -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and ignition coil is tested according to manufacturer's specifications.		
Tools and Equipment: Coil Tester Ohmmeter Oscilloscope	Resources:	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 14	
Task: Replace distributor cap using appropriate equipment to restore distributor cap operation.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for cylinder numbering sequence, firing order, and rotation -		_____	_____
2. Removed distributor cap hold down screws or clips -		_____	_____
3. Removed distributor cap (did not remove wires at this time) -		_____	_____
4. Removed and inspected rotor -		_____	_____
5. Installed rotor -		_____	_____
6. Installed new distributor cap -		_____	_____
7. Removed one spark plug wire at a time from old cap -		_____	_____
8. Placed it into correct terminal on new cap -		_____	_____
9. Checked firing order and worn positions -		_____	_____
10. Started engine and observed running condition -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and distributor cap is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																													
		Task No. 15																													
Task: Replace distributor rotor using appropriate equipment to restore distributor rotor operation.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Removed distributor cap hold down screws or clips -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed distributor cap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed and inspected rotor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed new rotor and aligned in proper notch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed distributor cap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Started engine and observed running condition -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Removed distributor cap hold down screws or clips -		_____	_____	2. Removed distributor cap -		_____	_____	3. Removed and inspected rotor -		_____	_____	4. Installed new rotor and aligned in proper notch -		_____	_____	5. Installed distributor cap -		_____	_____	6. Started engine and observed running condition -		_____	_____
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6. Started engine and observed running condition -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and distributor rotor is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Engine Tune-up (Ignition)		Duty No. E																					
		Task No. 16																					
Task: Test ignition timing using appropriate equipment to detect any deviation from manufacturer's specifications.																							
Achievement Indicators:		The learner: <table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>		Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and ignition timing is tested according to manufacturer's specifications.																							
Tools and Equipment: Basic Tool Set Timing Light Tachometer		Resources:																					

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E
		Task No. 17
Task: Adjust ignition timing using appropriate equipment to restore ignition timing to manufacturer's specifications.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for specifications and procedure to adjust ignition timing -		_____
2. Connected tachometer and timing light to engine -		_____
3. Started engine, ran at specified RPM and disconnected vacuum advance -		_____
4. Aimed flashing timing light at timing marks and observed their position -		_____
5. Compared timing marks to specifications -		_____
6. Loosened distributor hold down bolt -		_____
7. Adjusted ignition timing to manufacturer's specifications -		_____
8. Tightened distributor hold down bolt -		_____
9. Rechecked ignition timing -		_____
10. Reconnected all vacuum lines and readjusted idle speed -		_____
11. Disconnected tachometer and timing light -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and ignition timing is adjusted according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set Tachometer Timing Light	Resources:	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 18	
Task: Test automatic spark advance mechanism using appropriate equipment to detect any deviation from manufacturer's specifications.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for specifications and procedure to test automatic spark advance mechanism -	_____	_____	_____
2. Tested sensor delays and transducers according to manufacturer's specifications -	_____	_____	_____
3. Tested digital or analog computer according to manufacturer's specification -	_____	_____	_____
4. Replaced any components that do not meet manufacturer's specifications -	_____	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and automatic spark advance mechanism is tested to manufacturer's specifications.			
Tools and Equipment: Voltmeter Ohmmeter		Resources: 	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																													
		Task No. 19																													
Task: Replace automatic spark advance mechanism using appropriate equipment to restore automatic spark advance mechanism.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace automatic spark advance mechanism -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads from unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed unit from vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed new unit in vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Connected electrical leads to unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Started engine and tested operation of unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace automatic spark advance mechanism -		_____	_____	2. Disconnected electrical leads from unit -		_____	_____	3. Removed unit from vehicle -		_____	_____	4. Installed new unit in vehicle -		_____	_____	5. Connected electrical leads to unit -		_____	_____	6. Started engine and tested operation of unit -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure to replace automatic spark advance mechanism -		_____	_____																												
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6. Started engine and tested operation of unit -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and automatic spark advance mechanism is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set Advance Meter		Resources:																													

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 20	
Task: Inspect distributor using appropriate equipment to detect parts worn beyond manufacturer's specifications.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for procedure to inspect distributor -		_____	_____
2. Checked ignition cam lobe accuracy (point type distributor)-		_____	_____
3. Checked mechanical advance -		_____	_____
4. Checked vacuum advance and vacuum plate action -		_____	_____
5. Checked bushing shaft and breaker plate condition -		_____	_____
6. Repaired or replaced all worn components -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and parts worn beyond manufacturer's specifications are detected according to manufacturer's specifications.			
Tools and Equipment: Distributor Tester or Advance Meter		Resources:	

Duty: Certification: Engine Tune-up (Ignition System)

Duty No. E

Task No. 21

Task: Replace distributor using appropriate equipment to restore distributor operation.

Achievement Indicators:

The learner:

Yes

No

1. Referred to manufacturer's repair manual for procedure to replace distributor - ☐ ☐
2. Removed coil wire from top of distributor and ground to engine block - ☐ ☐
3. Cranked engine until number one cylinder is at top dead center on compression stroke - ☐ ☐
4. Checked distributor with rotor pointing towards number one cylinder on distributor - ☐ ☐
5. Removed hold down plate and screw - ☐ ☐
6. Removed distributor - ☐ ☐
7. Installed distributor with rotor pointing towards number one cylinder on distributor - ☐ ☐
8. Replaced hold down plate and screw - ☐ ☐
9. Replaced rotor and distributor cap - ☐ ☐
10. Placed wires in distributor cap according to firing order of vehicle manufacturer's specifications - ☐ ☐
11. Started engine and set RPM, ignition timing, dwell degree angle, reset RPM and checked engine performance - ☐ ☐

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and distributor is replaced according to manufacturer's specifications.	
Tools and Equipment: Basic Tool Set Timing Light	Resources:

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																																																	
		Task No. 22																																																	
Task: Rebuild distributor using appropriate equipment to restore distributor operation.																																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to rebuild distributor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed cap, rotor and dust seal -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disassembled terminal and took out breaker plate -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed coupling or gear -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Lifted shaft and advanced mechanism assembly out of distributor housing -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Disassembled advance mechanism, noting condition of bearing in distributor housing -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Repaired or replaced worn or defective parts as necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reassembled distributor making sure shaft end play is correct when installing gear or coupling -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Made adjustments to contact points and advances -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Lubricated distributor before reinstalling -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Installed distributor and performance tested mechanism -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to rebuild distributor -		_____	_____	2. Removed cap, rotor and dust seal -		_____	_____	3. Disassembled terminal and took out breaker plate -		_____	_____	4. Removed coupling or gear -		_____	_____	5. Lifted shaft and advanced mechanism assembly out of distributor housing -		_____	_____	6. Disassembled advance mechanism, noting condition of bearing in distributor housing -		_____	_____	7. Repaired or replaced worn or defective parts as necessary -		_____	_____	8. Reassembled distributor making sure shaft end play is correct when installing gear or coupling -		_____	_____	9. Made adjustments to contact points and advances -		_____	_____	10. Lubricated distributor before reinstalling -		_____	_____	11. Installed distributor and performance tested mechanism -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																																
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and distributor is rebuilt according to manufacturer's specifications.																																																			
Tools and Equipment: Advanced Tool Set Bushing Driver Set Timing Light		Resources: 																																																	

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																								
		Task No. 23																								
Task: Test electronic control unit using appropriate equipment to detect any deviation from manufacturer's specifications.																										
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test electronic control unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked voltage at specific points indicated by manufacturer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked resistance with ohmmeter at specific points indicated by manufacturer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared readings with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced defective electronic control unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test electronic control unit -		_____	_____	2. Checked voltage at specific points indicated by manufacturer -		_____	_____	3. Checked resistance with ohmmeter at specific points indicated by manufacturer -		_____	_____	4. Compared readings with manufacturer's specifications -		_____	_____	5. Replaced defective electronic control unit -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electronic control unit is tested according to manufacturer's specifications.																										
Tools and Equipment: Advanced Tool Set Voltmeter Ohmmeter		Resources:																								

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 24	
Task: Replace electronic control unit using appropriate equipment to restore electronic control unit operation.			
Achievement Indicators:		The learner:	
		Yes	No
1.	Referred to manufacturer's repair manual for correct procedure to replace electronic control unit -	_____	_____
2.	Disconnected electrical leads from control units -	_____	_____
3.	Removed control unit -	_____	_____
4.	Installed new control unit -	_____	_____
5.	Reattached electrical leads to control unit -	_____	_____
6.	Started engine to check operation of unit -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electronic control unit is replaced according to manufacturer's specifications.			
Tools and Equipment:		Resources:	
Basic Tool Set			

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																									
		Task No. 25																									
Task: Test electronic pickup coil using appropriate equipment to detect any deviation from manufacturer's specifications.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test electronic pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected power leads from pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked resistance of pickup coil with ohmmeter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared readings with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced defective coil pickup -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test electronic pickup coil -		_____	_____	2. Disconnected power leads from pickup coil -		_____	_____	3. Checked resistance of pickup coil with ohmmeter -		_____	_____	4. Compared readings with manufacturer's specifications -		_____	_____	5. Replaced defective coil pickup -		_____	_____
Achievement Indicators:	The learner:	Yes	No																								
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electronic pickup coil is tested according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set Ohmmeter		Resources:																									

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E																																									
		Task No. 26																																									
Task: Replace electronic pickup coil using appropriate equipment to restore electronic control unit operation.																																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace electronic pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed distributor cap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical leads from pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed pickup coil and was sure all fasteners were tightened -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Connected electrical leads to pickup coil -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Adjusted air gap if necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Replaced distributor cap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Started engine to check proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace electronic pickup coil -		_____	_____	2. Removed distributor cap -		_____	_____	3. Disconnected electrical leads from pickup coil -		_____	_____	4. Removed pickup coil -		_____	_____	5. Installed pickup coil and was sure all fasteners were tightened -		_____	_____	6. Connected electrical leads to pickup coil -		_____	_____	7. Adjusted air gap if necessary -		_____	_____	8. Replaced distributor cap -		_____	_____	9. Started engine to check proper operation -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electronic pickup coil is replaced according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set		Resources:																																									

Duty: Certification: Engine Tune-up (Ignition System)		Duty No. E	
		Task No. 27	
Task: Test ignition system using engine analyzer to detect any meter reading, digital readout, or scope display deviation from manufacturer's specifications.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to vehicle manufacturer's service information to determine procedure and specifications of the following:			
a. curb idle adjustment - $\pm$ 50 RPM -		_____	_____
b. air-fuel mixture adjustment -		_____	_____
c. dwell adjustment - $\pm$ 2 degrees -		_____	_____
d. ignition timing adjustment - $\pm$ 1 degree -		_____	_____
2. Referred to engine analyzer manufacturer's operating instructions to determine analyzer testing procedure -		_____	_____
3. Performed testing procedure to determine required adjustments -		_____	_____
4. Performed all required minor adjustments in accordance with manufacturer's procedure and specifications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine is tested using an engine analyzer.			
Tools and Equipment: Engine Analyzer		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 1	
Task: Test carburetor adjustment using combustion analyzer to detect a carburetor mixture deviating from manufacturer's specifications.			
Achievement Indicators:		The learner:	
		Yes	No
1.	Referred to manufacturer's repair manual for correct procedure to test carburetor adjustment using combustion analyzer -	_____	_____
2.	Referred to test equipment manufacturer's procedure sheet to set up combustion analyzer -	_____	_____
3.	Connected a tachometer to engine -	_____	_____
4.	Connected vacuum gauge to intake manifold -	_____	_____
5.	Adjusted engine speed to specified RPM -	_____	_____
6.	Compared readings to specifications -	_____	_____
7.	Made fine adjustments, moving carburetor idle mixture screw to obtain desired setting -	_____	_____
8.	Readjusted idle speed to specifications -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor adjustment is tested according to manufacturer's specifications with combustion analyzer.			
Tools and Equipment: Basic Tool Set Combustion Analyzer Tachometer Vacuum Gauge		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																	
		Task No. 2																																	
Task: Test carburetor adjustment using infrared tester to detect hydrocarbon and carbon monoxide levels exceeding manufacturer's specifications.																																			
<table border="0"> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing carburetor adjustment using infrared tester -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Referred to infrared tester's information sheet on proper set up and calibration of tester -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected tachometer to engine -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Adjusted idle speed to specified RPM -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Compared HC and CO readings to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Made fine adjustments, moving carburetor idle mixture screw to obtain desired setting -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Readjusted idle speed to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing carburetor adjustment using infrared tester -		_____	_____	2. Referred to infrared tester's information sheet on proper set up and calibration of tester -		_____	_____	3. Connected tachometer to engine -		_____	_____	4. Adjusted idle speed to specified RPM -		_____	_____	5. Compared HC and CO readings to specifications -		_____	_____	6. Made fine adjustments, moving carburetor idle mixture screw to obtain desired setting -		_____	_____	7. Readjusted idle speed to specifications -		_____	_____
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5. Compared HC and CO readings to specifications -		_____	_____																																
6. Made fine adjustments, moving carburetor idle mixture screw to obtain desired setting -		_____	_____																																
7. Readjusted idle speed to specifications -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor adjustment is tested according to manufacturer's specifications using infrared tester.																																			
Tools and Equipment: Basic Tool Set Infrared Tester Tachometer		Resources:																																	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 3	
Task: Test carburetor adjustment using propane enrichment apparatus.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test carburetor adjustment using propane enrichment -		_____	_____
2. Connected tachometer to engine -		_____	_____
3. Checked ignition timing and adjusted to specifications -		_____	_____
4. Adjusted idle speed to specified idle mixture adjusting speed -		_____	_____
5. Connected propane enrichment tool to engine -		_____	_____
6. Opened propane valve slowly until max idle speed is reached -		_____	_____
7. Compared reading to specifications -		_____	_____
8. Readjusted mixture screws to specifications if readings do not compare to specifications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been recognized according to the supervisor's directions and carburetor adjustment is tested according to manufacturer's specifications using propane enrichment.			
Tools and Equipment: Basic Tool Set Propane Enrichment Tool Tachometer		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 4																													
Task: Adjust carburetor idle mixture using appropriate equipment to restore idle mixture within manufacturer's specified range with attachment hardware tightened, and there are no fuel or vacuum leaks.																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to adjust carburetor idle mixture -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected tachometer to engine -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected vacuum gauge to intake manifold vacuum -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Adjusted engine speed to specified RPM -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Turned mixture screws to obtain smoothest idle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Continued turning mixture screws inward (lean drop), until RPM drops off to specified amount -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to adjust carburetor idle mixture -		_____	_____	2. Connected tachometer to engine -		_____	_____	3. Connected vacuum gauge to intake manifold vacuum -		_____	_____	4. Adjusted engine speed to specified RPM -		_____	_____	5. Turned mixture screws to obtain smoothest idle -		_____	_____	6. Continued turning mixture screws inward (lean drop), until RPM drops off to specified amount -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure to adjust carburetor idle mixture -		_____	_____																												
2. Connected tachometer to engine -		_____	_____																												
3. Connected vacuum gauge to intake manifold vacuum -		_____	_____																												
4. Adjusted engine speed to specified RPM -		_____	_____																												
5. Turned mixture screws to obtain smoothest idle -		_____	_____																												
6. Continued turning mixture screws inward (lean drop), until RPM drops off to specified amount -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor idle mixture is adjusted according to manufacturer's specifications and so there are no fuel or vacuum leaks.																															
Tools and Equipment: Basic Tool Set Vacuum Gauge Tachometer		Resources:																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 5																													
Task: Adjust anti-stall device using appropriate equipment to restore anti-stall operation.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for adjusting anti-stall device -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Closed throttle and depressed dashpot -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Inserted feeler gauge to measured clearance -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared measurement to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Adjusted to specifications if necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Started engine and checked for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for adjusting anti-stall device -		_____	_____	2. Closed throttle and depressed dashpot -		_____	_____	3. Inserted feeler gauge to measured clearance -		_____	_____	4. Compared measurement to specifications -		_____	_____	5. Adjusted to specifications if necessary -		_____	_____	6. Started engine and checked for proper operation -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure for adjusting anti-stall device -		_____	_____																												
2. Closed throttle and depressed dashpot -		_____	_____																												
3. Inserted feeler gauge to measured clearance -		_____	_____																												
4. Compared measurement to specifications -		_____	_____																												
5. Adjusted to specifications if necessary -		_____	_____																												
6. Started engine and checked for proper operation -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and anti-stall device is adjusted according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 6	
Task: Inspect carburetor linkage using appropriate equipment to detect all binding and worn parts.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to inspect carburetor linkage -		_____	_____
2. Operated linkage from stop to stop -		_____	_____
3. Checked for any binding or worn parts -		_____	_____
4. Replaced or repaired all worn or damaged components -		_____	_____
5. Adjusted all linkage to specifications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor linkage is inspected according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																	
		Task No. 7																																	
Task: Check carburetor for vacuum leaks using appropriate equipment to detect all mounting and/or assembly vacuum leaks.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to check carburetor vacuum leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected tachometer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected vacuum gauge to intake manifold -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Started engine and warmed to engine operating temperature -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Recorded vacuum and tachometer readings -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Sprayed carburetor cleaner oil and fuel oil mixture, or approved cleaner on all gaskets -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Repaired any vacuum leak that caused a change in RPM and vacuum -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to check carburetor vacuum leaks -		_____	_____	2. Connected tachometer -		_____	_____	3. Connected vacuum gauge to intake manifold -		_____	_____	4. Started engine and warmed to engine operating temperature -		_____	_____	5. Recorded vacuum and tachometer readings -		_____	_____	6. Sprayed carburetor cleaner oil and fuel oil mixture, or approved cleaner on all gaskets -		_____	_____	7. Repaired any vacuum leak that caused a change in RPM and vacuum -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
1. Referred to manufacturer's repair manual for correct procedure to check carburetor vacuum leaks -		_____	_____																																
2. Connected tachometer -		_____	_____																																
3. Connected vacuum gauge to intake manifold -		_____	_____																																
4. Started engine and warmed to engine operating temperature -		_____	_____																																
5. Recorded vacuum and tachometer readings -		_____	_____																																
6. Sprayed carburetor cleaner oil and fuel oil mixture, or approved cleaner on all gaskets -		_____	_____																																
7. Repaired any vacuum leak that caused a change in RPM and vacuum -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor is checked for vacuum leaks according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set Tachometer Vacuum Gauge	Resources:																																		

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 8	
Task: Remove carburetor air cleaner using appropriate equipment to restore air cleaner operation according to manufacturer's specifications and so that air cleaner is installed.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace carburetor air cleaner -		_____	_____
2. Removed any vacuum lines, PCV hose, fresh air ducts and any electrical connections -		_____	_____
3. Removed hold down wing nuts or cap screws that secure air cleaner -		_____	_____
4. Removed air cleaner assembly -		_____	_____
5. Installed air cleaner assembly -		_____	_____
6. Tightened hold down wing nut or cap screws that secure air cleaner -		_____	_____
7. Connected all vacuum lines, PCV hose, fresh air ducts and any electrical connections -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and air cleaner is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																					
		Task No. 9																					
Task: Check carburetor air cleaner element using appropriate equipment to detect any restriction (dirt) which decreases air flow beyond manufacturer's specifications.																							
<table border="0"> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to check air cleaner element -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>2. Removed carburetor air filter element -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>3. Inspected filter element for dirt visually with light bulb -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>4. Replaced or reinstalled filter -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to check air cleaner element -		_____	_____	2. Removed carburetor air filter element -		_____	_____	3. Inspected filter element for dirt visually with light bulb -		_____	_____	4. Replaced or reinstalled filter -		_____	_____
Achievement Indicators:	The learner:	Yes	No																				
1. Referred to manufacturer's repair manual for correct procedure to check air cleaner element -		_____	_____																				
2. Removed carburetor air filter element -		_____	_____																				
3. Inspected filter element for dirt visually with light bulb -		_____	_____																				
4. Replaced or reinstalled filter -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor air cleaner element is checked according to manufacturer's specifications.																							
Tools and Equipment: Basic Tool Set Trouble Light		Resources:																					

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F			
		Task No. 10			
Task: Clean carburetor air cleaner using appropriate equipment to restore air cleaner operation.					
Achievement Indicators:		The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for cleaning carburetor air cleaner -				_____	_____
2. Removed air cleaner cover -				_____	_____
3. Removed air cleaner element and inspected -				_____	_____
4. Cleaned air cleaner with clean shop rag -				_____	_____
5. Installed air cleaner element and covered -				_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor air cleaner is cleaned according to manufacturer's specifications.					
Tools and Equipment: Basic Tool Set		Resources:			

Duty: Certification: Engine Tune-up (Fuel System)		Duty: F																																
		Task No. 11																																
Task: Clean automatic choke using appropriate equipment to restore choke operation.																																		
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for cleaning automatic choke -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed carburetor air cleaner -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disassembled automatic choke -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Cleaned screw unit, if appropriate -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Checked sticking of piston and freeness of linkage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Reassembled automatic choke -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Adjusted choke to recommended setting -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for cleaning automatic choke -		_____	_____	2. Removed carburetor air cleaner -		_____	_____	3. Disassembled automatic choke -		_____	_____	4. Cleaned screw unit, if appropriate -		_____	_____	5. Checked sticking of piston and freeness of linkage -		_____	_____	6. Reassembled automatic choke -		_____	_____	7. Adjusted choke to recommended setting -		_____	_____
Achievement Indicators:	The learner:	Yes	No																															
1. Referred to manufacturer's repair manual for correct procedure for cleaning automatic choke -		_____	_____																															
2. Removed carburetor air cleaner -		_____	_____																															
3. Disassembled automatic choke -		_____	_____																															
4. Cleaned screw unit, if appropriate -		_____	_____																															
5. Checked sticking of piston and freeness of linkage -		_____	_____																															
6. Reassembled automatic choke -		_____	_____																															
7. Adjusted choke to recommended setting -		_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and automatic choke is cleaned according to manufacturer's specifications.																																		
Tools and Equipment: Basic Tool Set	Resources:																																	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																	
		Task No. 12																	
Task: Adjust automatic choke using appropriate equipment to restore choke operation.																			
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to adjust automatic choke -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Adjusted choke to manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to adjust automatic choke -		_____	_____	2. Adjusted choke to manufacturer's specifications -		_____	_____	3. Checked for proper operation -		_____	_____
Achievement Indicators:	The learner:	Yes	No																
1. Referred to manufacturer's repair manual for correct procedure to adjust automatic choke -		_____	_____																
2. Adjusted choke to manufacturer's specifications -		_____	_____																
3. Checked for proper operation -		_____	_____																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and automatic choke is adjusted according to manufacturer's specifications.																			
Tools and Equipment: Basic Tool Set		Resources:																	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 13																													
Task: Check manifold heat riser valve using appropriate equipment to detect binding.																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to check manifold heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked for free movement of heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked thermostatic spring operation if applicable -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked vacuum operated heat riser valve with vacuum pump -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected sensors controlling heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Repaired or replaced all defective components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to check manifold heat riser valve -		_____	_____	2. Checked for free movement of heat riser valve -		_____	_____	3. Checked thermostatic spring operation if applicable -		_____	_____	4. Checked vacuum operated heat riser valve with vacuum pump -		_____	_____	5. Inspected sensors controlling heat riser valve -		_____	_____	6. Repaired or replaced all defective components -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure to check manifold heat riser valve -		_____	_____																												
2. Checked for free movement of heat riser valve -		_____	_____																												
3. Checked thermostatic spring operation if applicable -		_____	_____																												
4. Checked vacuum operated heat riser valve with vacuum pump -		_____	_____																												
5. Inspected sensors controlling heat riser valve -		_____	_____																												
6. Repaired or replaced all defective components -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and manifold heat riser valve is checked according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set		Resources:																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																					
		Task No. 14																																					
Task: Replace manifold heat riser valve using appropriate equipment to restore valve operation.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing manifold heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed exhaust pipe from exhaust manifold -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed new gaskets and replaced heat riser valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed exhaust pipe to exhaust manifold -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Started engine -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked for exhaust leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked for proper heat riser operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing manifold heat riser valve -		_____	_____	2. Removed exhaust pipe from exhaust manifold -		_____	_____	3. Removed heat riser valve -		_____	_____	4. Installed new gaskets and replaced heat riser valve -		_____	_____	5. Installed exhaust pipe to exhaust manifold -		_____	_____	6. Started engine -		_____	_____	7. Checked for exhaust leaks -		_____	_____	8. Checked for proper heat riser operation -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																				
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6. Started engine -		_____	_____																																				
7. Checked for exhaust leaks -		_____	_____																																				
8. Checked for proper heat riser operation -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and manifold heat riser valve is replaced according to manufacturer's specifications and so there are no exhaust leaks.																																							
Tools and Equipment: Basic Tool Set	Resources:																																						

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 15																													
Task: Clean heat riser passages using appropriate equipment to restore heat riser passages.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for cleaning heat riser passages -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>2. Removed intake manifold and carburetor -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>3. Cleaned heat passages in cylinder head, intake manifold and carburetor base -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>4. Installed all new gaskets -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>5. Installed carburetor and intake manifold -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>6. Started engine and checked for vacuum and exhaust leaks -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for cleaning heat riser passages -		_____	_____	2. Removed intake manifold and carburetor -		_____	_____	3. Cleaned heat passages in cylinder head, intake manifold and carburetor base -		_____	_____	4. Installed all new gaskets -		_____	_____	5. Installed carburetor and intake manifold -		_____	_____	6. Started engine and checked for vacuum and exhaust leaks -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure for cleaning heat riser passages -		_____	_____																												
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4. Installed all new gaskets -		_____	_____																												
5. Installed carburetor and intake manifold -		_____	_____																												
6. Started engine and checked for vacuum and exhaust leaks -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to supervisor's directions and heat riser passages are cleaned according to manufacturer's specifications and so there are no exhaust or vacuum leaks.																															
Tools and Equipment: Advanced Tool Set		Resources:																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F			
		Task No. 16			
Task: Adjust float using appropriate equipment to restore float operation.					
Achievement Indicators:		The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for adjusting float -				_____	_____
2. Removed carburetor air cleaner -				_____	_____
3. Disconnected fuel line, linkage, etc. -				_____	_____
4. Removed air horn cover or float bowl cover -				_____	_____
5. Adjusted float drop, level and alignment to specifications-				_____	_____
6. Reassembled carburetor -				_____	_____
7. Installed carburetor air cleaner -				_____	_____
8. Started engine and checked for proper operation -				_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and float is adjusted according to manufacturer's specifications.					
Tools and Equipment: Advanced Tool Set		Resources:			

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F
		Task No. 17
Task: Adjust carburetor metering rods using appropriate equipment to restore carburetor metering rod operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure for adjusting carburetor metering rods -	_____	_____
2. Disassembled carburetor to gain access to metering rods -	_____	_____
3. Adjusted metering rods to specifications -	_____	_____
4. Reassembled carburetor -	_____	_____
5. Started engine and checked for proper operation -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and metering rods are adjusted according to manufacturer's specifications.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 18																													
Task: Replace carburetor metering jets using appropriate equipment to restore carburetor metering jet operation.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing carburetor metering rods -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>2. Disassembled carburetor to gain access to metering jets -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>3. Removed metering jets -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>4. Installed metering jets -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>5. Reassembled carburetor -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>6. Started engine and checked for proper operation -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing carburetor metering rods -		_____	_____	2. Disassembled carburetor to gain access to metering jets -		_____	_____	3. Removed metering jets -		_____	_____	4. Installed metering jets -		_____	_____	5. Reassembled carburetor -		_____	_____	6. Started engine and checked for proper operation -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
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6. Started engine and checked for proper operation -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and metering jets are replaced according to manufacturer's specifications.																															
Tools and Equipment: Advanced Tool Set		Resources:																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																	
		Task No. 19																																	
Task: Replace carburetor using appropriate equipment to restore carburetor operation.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing carburetor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed carburetor air cleaner -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected accelerator linkage, fuel line, automatic choke, and vacuum lines where required -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed carburetor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed carburetor, following procedures in reverse -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Torqued all mounting bolts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Completed final carburetor servicing as required -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing carburetor -		_____	_____	2. Removed carburetor air cleaner -		_____	_____	3. Disconnected accelerator linkage, fuel line, automatic choke, and vacuum lines where required -		_____	_____	4. Removed carburetor -		_____	_____	5. Installed carburetor, following procedures in reverse -		_____	_____	6. Torqued all mounting bolts -		_____	_____	7. Completed final carburetor servicing as required -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
1. Referred to manufacturer's repair manual for correct procedure for replacing carburetor -		_____	_____																																
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5. Installed carburetor, following procedures in reverse -		_____	_____																																
6. Torqued all mounting bolts -		_____	_____																																
7. Completed final carburetor servicing as required -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor is placed according to manufacturer's specifications and so linkage does not bind or stick and there are no fuel or vacuum leaks.																																			
Tools and Equipment: Basic Tool Set		Resources:																																	

Duty: Certification: Engine Tune-up		Duty No. F	
		Task No. 20	
Task: Rebuild carburetor using appropriate equipment to restore carburetor operation.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to rebuild carburetor -		_____	_____
2. Removed carburetor from vehicle -		_____	_____
3. Drained carburetor of fuel -		_____	_____
4. Disassembled carburetor and placed in carburetor cleaner -		_____	_____
5. After cleaning, reassembled carburetor replacing power valve, gaskets and seals as required -		_____	_____
6. Performed all carburetor adjustments/calibrations following car manufacturer's procedures and specifications -		_____	_____
7. Reinstalled carburetor on vehicle engine -		_____	_____
8. Brought engine to operating temperatures and completed carburetor adjustments -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and carburetor is rebuilt according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set Tachometer Infrared		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																													
		Task No. 21																																													
Task: Replace fuel filter unit using appropriate equipment to restore fuel filter operation.																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing fuel filter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed carburetor air cleaner assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected fuel line at carburetor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed fuel filter from carburetor inlet (if so equipped) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed filter from fuel line (if in-line type) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Replaced fuel filter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected carburetor fuel lines -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked for fuel leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed carburetor air cleaner assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Test drove vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing fuel filter -		_____	_____	2. Removed carburetor air cleaner assembly -		_____	_____	3. Disconnected fuel line at carburetor -		_____	_____	4. Removed fuel filter from carburetor inlet (if so equipped) -		_____	_____	5. Removed filter from fuel line (if in-line type) -		_____	_____	6. Replaced fuel filter -		_____	_____	7. Connected carburetor fuel lines -		_____	_____	8. Checked for fuel leaks -		_____	_____	9. Installed carburetor air cleaner assembly -		_____	_____	10. Test drove vehicle -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																												
1. Referred to manufacturer's repair manual for correct procedure for replacing fuel filter -		_____	_____																																												
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4. Removed fuel filter from carburetor inlet (if so equipped) -		_____	_____																																												
5. Removed filter from fuel line (if in-line type) -		_____	_____																																												
6. Replaced fuel filter -		_____	_____																																												
7. Connected carburetor fuel lines -		_____	_____																																												
8. Checked for fuel leaks -		_____	_____																																												
9. Installed carburetor air cleaner assembly -		_____	_____																																												
10. Test drove vehicle -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel filter is replaced according to manufacturer's specifications and so fuel connections do not leak.																																															
Tools and Equipment: Basic Tool Set	Resources:																																														

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 22	
Task: Test fuel pump using appropriate equipment to detect deviations in pressure, volume or vacuum readings.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing fuel pump -		_____	_____
2. Removed air cleaner assembly -		_____	_____
3. Disconnected fuel line at carburetor -		_____	_____
4. Connected fuel pressure and flow gauge to fuel line in accordance with manufacturer's specifications -		_____	_____
5. Started engine and ran at specified RPM for specified time -		_____	_____
6. Compared readings with specifications -		_____	_____
7. Disconnected inlet line from fuel pump -		_____	_____
8. Connected vacuum line to inlet side of pump -		_____	_____
9. Cranked engine and compared vacuum readings to specifications -		_____	_____
10. Replaced or repaired defective fuel pump -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel pump is tested according to manufacturer's specifications to detect deviations in pressure, volume or vacuum readings.			
Tools and Equipment: Basic Tool Set Vacuum Gauge Fuel Pump Tester		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 23	
Task: Replace fuel pump using appropriate equipment to restore fuel pump operation.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing fuel pump -		_____	_____
2. Disconnected fuel lines from fuel pump -		_____	_____
3. Removed mounting bolts holding fuel pump -		_____	_____
4. Installed new fuel pump mounting gasket on replacement pump -		_____	_____
5. Installed replacement pump -		_____	_____
6. Connected fuel lines -		_____	_____
7. Started vehicle and checked for fuel leaks -		_____	_____
8. Test drove vehicle -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel pump is replaced according to manufacturer's specifications.			
Tools and Equipment:	Resources:		
Basic Tool Set			

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																													
		Task No. 24																																													
Task: Test fuel injection system using appropriate equipment to detect any deviation of fuel flow, timing or electrical circuit continuity.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing fuel injection system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Visually inspected wires, connections, vacuum lines, and fuel lines for damage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked system fuse and fusible link for opens -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Performed fuel pressure regulator test -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Performed cranking voltage signal test -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Performed throttle position switch test -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Performed speed sensor test, coolant, vacuum solenoid and other sensor tests -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Tested injector valves -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Compared all test results to manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Repaired, adjusted or replaced -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing fuel injection system -		_____	_____	2. Visually inspected wires, connections, vacuum lines, and fuel lines for damage -		_____	_____	3. Checked system fuse and fusible link for opens -		_____	_____	4. Performed fuel pressure regulator test -		_____	_____	5. Performed cranking voltage signal test -		_____	_____	6. Performed throttle position switch test -		_____	_____	7. Performed speed sensor test, coolant, vacuum solenoid and other sensor tests -		_____	_____	8. Tested injector valves -		_____	_____	9. Compared all test results to manufacturer's specifications -		_____	_____	10. Repaired, adjusted or replaced -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel injection system is tested according to manufacturer's specifications.																																															
Tools and Equipment: Advanced Tool Set Voltmeter Ohmmeter		Resources:																																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																					
		Task No. 25																																					
Task: Replace electrical fuel injection computer using appropriate equipment to restore electrical fuel injection computer operation.																																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing electrical fuel injection computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed necessary components to gain access to computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed power and sensor leads from computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed computer from vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Connected all power and sensor leads to computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reinstalled components removed to gain access to computer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Started engine and checked for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing electrical fuel injection computer -		_____	_____	2. Removed necessary components to gain access to computer -		_____	_____	3. Removed power and sensor leads from computer -		_____	_____	4. Removed computer from vehicle -		_____	_____	5. Installed replacement computer -		_____	_____	6. Connected all power and sensor leads to computer -		_____	_____	7. Reinstalled components removed to gain access to computer -		_____	_____	8. Started engine and checked for proper operation -		_____	_____
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8. Started engine and checked for proper operation -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and injection computer is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources: 																																					

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F.	
		Task No. 26	
Task: Test wiring harness for electronic fuel injection using appropriate equipment to detect any open, shorted, or out of tolerance circuits.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing wiring harness for electronic fuel injection -		_____	_____
2. Visually inspected all connectors for loose connections, damaged wiring or incorrect connections -		_____	_____
3. Checked for opens, shorts or excessive resistance with ohmmeter -		_____	_____
4. Compared readings to specifications -		_____	_____
5. Repaired or replaced all defective wiring components -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and wiring harness is tested according to manufacturer's specifications to detect any open, shorted or out of tolerance circuits.			
Tools and Equipment: Basic Tool Set Ohmmeter		Resources:	

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																													
		Task No. 27																													
Task: Replace wiring harness for electronic fuel injection using appropriate equipment to restore wiring harness operation.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing wiring harness for electronic fuel injection -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>2. Disconnected wiring harness from all components one at a time -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>3. Connected new wire harness to each component as the old was disconnected -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>4. Routed harness according to manufacturer's specifications -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>5. Secured all connections -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>6. Started engine and checked for proper operation -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing wiring harness for electronic fuel injection -		_____	_____	2. Disconnected wiring harness from all components one at a time -		_____	_____	3. Connected new wire harness to each component as the old was disconnected -		_____	_____	4. Routed harness according to manufacturer's specifications -		_____	_____	5. Secured all connections -		_____	_____	6. Started engine and checked for proper operation -		_____	_____
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4. Routed harness according to manufacturer's specifications -		_____	_____																												
5. Secured all connections -		_____	_____																												
6. Started engine and checked for proper operation -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and wiring harness is replaced according to manufacturer's specifications and so all electrical connections are tight.																															
Tools and Equipment: Basic Tool Set		Resources:																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																													
		Task No. 28																																													
Task: Replace fuel injection nozzle using appropriate equipment to restore fuel injection nozzle operation.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing fuel injection nozzle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Relieved pressure in fuel rail -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical lead from injector -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Disconnected fuel inlet line from fuel rail -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Disconnected fuel return hose and vacuum line from pressure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Removed fuel rail and injectors as a unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Removed injector from fuel rail -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed new injector -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Reassembled in reverse order above -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Turned ignition switch on and off several times to build up fuel pressure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing fuel injection nozzle -		_____	_____	2. Relieved pressure in fuel rail -		_____	_____	3. Disconnected electrical lead from injector -		_____	_____	4. Disconnected fuel inlet line from fuel rail -		_____	_____	5. Disconnected fuel return hose and vacuum line from pressure -		_____	_____	6. Removed fuel rail and injectors as a unit -		_____	_____	7. Removed injector from fuel rail -		_____	_____	8. Installed new injector -		_____	_____	9. Reassembled in reverse order above -		_____	_____	10. Turned ignition switch on and off several times to build up fuel pressure -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																												
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10. Turned ignition switch on and off several times to build up fuel pressure -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel injection nozzle is replaced according to manufacturer's specifications and so all connections are tight and fuel does not leak.																																															
Tools and Equipment: Advanced Tool Set		Resources:																																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 29	
Task: Rebuild fuel injection nozzle using appropriate equipment to restore fuel injection nozzle operation.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to rebuild fuel injection nozzle -		_____	_____
2. Removed components necessary to gain access to injection nozzles -		_____	_____
3. Disassembled injection nozzles according to manufacturer's specifications -		_____	_____
4. Replaced all defective or worn components -		_____	_____
5. Reassembled injection nozzles according to manufacturer's specifications -		_____	_____
6. Installed injection nozzles -		_____	_____
7. Reinstalled all components removed to gain access to nozzles -		_____	_____
8. Started engine and checked operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and injection nozzles are rebuilt according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set	Resources:		

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																					
		Task No. 30																																					
Task: Replace fuel injection pump using appropriate equipment to restore fuel injection pump operation.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace fuel injection pump -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected inlet and outlet hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed pump (tank mounted pumps' fuel level must be lower than pump) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement pump -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Reconnected inlet and outlet hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected electrical leads to pump terminals -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Started engine and checked operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace fuel injection pump -		_____	_____	2. Disconnected electrical leads -		_____	_____	3. Disconnected inlet and outlet hoses -		_____	_____	4. Removed pump (tank mounted pumps' fuel level must be lower than pump) -		_____	_____	5. Installed replacement pump -		_____	_____	6. Reconnected inlet and outlet hoses -		_____	_____	7. Connected electrical leads to pump terminals -		_____	_____	8. Started engine and checked operation -		_____	_____
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Tools and Equipment: Advanced Tool Set	Resources:																																						

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																	
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Task: Rebuild fuel injection pump using appropriate equipment to restore fuel injection pump operation.																																			
<table border="0"> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to rebuild fuel injection pump -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Disassembled fuel injection pump -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Inspected all parts for damage or wear beyond manufacturer's specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Replaced all worn or defective parts -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Reassembled fuel injection pump -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Installed the rebuilt pump -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Started engine and checked for proper operation -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to rebuild fuel injection pump -		☐	☐	2. Disassembled fuel injection pump -		☐	☐	3. Inspected all parts for damage or wear beyond manufacturer's specifications -		☐	☐	4. Replaced all worn or defective parts -		☐	☐	5. Reassembled fuel injection pump -		☐	☐	6. Installed the rebuilt pump -		☐	☐	7. Started engine and checked for proper operation -		☐	☐
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Tools and Equipment: Advanced Tool Set	Resources:																																		

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																					
		Task No. 32																																					
Task: Test waste gate adjustment using appropriate equipment to detect any deviation from manufacturer's specifications.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing waste gate adjustment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Visually inspected waste gate-actuator mechanical linkage for damage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked hose from plenum to actuator assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Attached hand operated vacuum pump to actuator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Applied vacuum to actuator assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Measured actuator rod movement at 3" high -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Compared to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Replaced or adjusted actuator assembly if measurement did not meet specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing waste gate adjustment -		_____	_____	2. Visually inspected waste gate-actuator mechanical linkage for damage -		_____	_____	3. Checked hose from plenum to actuator assembly -		_____	_____	4. Attached hand operated vacuum pump to actuator -		_____	_____	5. Applied vacuum to actuator assembly -		_____	_____	6. Measured actuator rod movement at 3" high -		_____	_____	7. Compared to specifications -		_____	_____	8. Replaced or adjusted actuator assembly if measurement did not meet specifications -		_____	_____
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Tools and Equipment: Basic Tool Set Vacuum Pump		Resources: 																																					

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																													
		Task No. 33																																													
Task: Adjust waste gate using appropriate equipment to restore waste gate operation.																																															
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and waste gate is adjusted according to manufacturer's specifications.																																															
Tools and Equipment: Basic Tool Set Vacuum Pump		Resources:																																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F	
		Task No. 34	
Task: Replace turbo-charger using appropriate equipment to restore turbo-charger operation.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's specifications for correct procedure for replacing turbo-charger -		_____	_____
2. Disconnected turbo-charger inlet and outlet exhaust pipe -		_____	_____
3. Disconnected oil feed pipe -		_____	_____
4. Removed elbow from carburetor -		_____	_____
5. Disconnected all linkage and hoses from carburetor and plenum -		_____	_____
6. Drained cooling system -		_____	_____
7. Disconnected cooling hoses to plenum -		_____	_____
8. Removed turbo-charger and actuator -		_____	_____
9. Removed turbo-charger from actuator -		_____	_____
10. Connected replacement turbo-charger to actuator -		_____	_____
11. Connected turbo-charger and actuator to engine -		_____	_____
12. Connected cooling system -		_____	_____
13. Refilled cooling system -		_____	_____
14. Connected all linkage and hoses to carburetor and plenum -		_____	_____
15. Installed elbow to carburetor -		_____	_____
16. Connected oil feed pipe -		_____	_____
17. Connected turbo-charger inlet and outlet exhaust pipe -		_____	_____
18. Conducted performance test on turbo-charger -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and turbo-charger is replaced according to manufacturer's specifications and so turbo-charger is torqued and there is no oil, vacuum or pressure leaks.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																																					
		Task No. 35																																																					
Task: Rebuild turbo-charger using appropriate equipment to restore turbo-charger operation.																																																							
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Tools and Equipment: Advanced Tool Set		Resources:																																																					

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																													
		Task No. 36																																													
Task: Replace fuel lines using appropriate equipment to restore fuel line operation.																																															
<table border="0"> <thead> <tr> <th style="text-align: left;">Achievement Indicators:</th> <th style="text-align: left;">The learner:</th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing fuel lines -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Raised car on hoist or placed on safety stands -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Disconnected fuel lines from fuel tank and inlet side of carburetor -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Removed fuel lines from along frame area -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Inspected fuel line for leaks and damages -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Replaced flexible fuel line (if defective) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Repaired or replaced flex line as required -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Disconnected fuel line from outlet side of fuel pump to carburetor -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Repaired or replaced metal line as required -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Lowered vehicle and test drove -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing fuel lines -		_____	_____	2. Raised car on hoist or placed on safety stands -		_____	_____	3. Disconnected fuel lines from fuel tank and inlet side of carburetor -		_____	_____	4. Removed fuel lines from along frame area -		_____	_____	5. Inspected fuel line for leaks and damages -		_____	_____	6. Replaced flexible fuel line (if defective) -		_____	_____	7. Repaired or replaced flex line as required -		_____	_____	8. Disconnected fuel line from outlet side of fuel pump to carburetor -		_____	_____	9. Repaired or replaced metal line as required -		_____	_____	10. Lowered vehicle and test drove -		_____	_____
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Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																																					
		Task No. 37																																																					
Task: Replace fuel tank using appropriate equipment to restore fuel tank operation.																																																							
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Tools and Equipment: Basic Tool Set		Resources:																																																					

Duty: Certification: Engine Tune-up (Fuel System)		Duty No. F																																																					
		Task No. 38																																																					
Task: Replace fuel level sending unit using appropriate equipment to restore fuel sending unit operation.																																																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing fuel level sending unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Placed vehicle on suitable hoist or safety stands -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Disconnected fuel lines, sending unit wire and ground -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Removed fuel tank -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Cleaned off all dirt and particles that may fall into fuel tank with air or brush -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Removed sending unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Installed new sending unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>8. Connected ground wire between tank and frame of vehicle -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>9. Connected sending unit wire -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>10. Checked dash unit for proper operation -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>11. Reinstalled fuel tank -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>12. Lowered vehicle -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing fuel level sending unit -		☐	☐	2. Placed vehicle on suitable hoist or safety stands -		☐	☐	3. Disconnected fuel lines, sending unit wire and ground -		☐	☐	4. Removed fuel tank -		☐	☐	5. Cleaned off all dirt and particles that may fall into fuel tank with air or brush -		☐	☐	6. Removed sending unit -		☐	☐	7. Installed new sending unit -		☐	☐	8. Connected ground wire between tank and frame of vehicle -		☐	☐	9. Connected sending unit wire -		☐	☐	10. Checked dash unit for proper operation -		☐	☐	11. Reinstalled fuel tank -		☐	☐	12. Lowered vehicle -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and fuel level sending unit is replaced according to manufacturer's specifications.																																																							
Tools and Equipment: Basic Tool Set		Resources:																																																					

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G			
		Task No. 1			
Task: Test P.C.V. system using appropriate equipment to detect any deviations from manufacturer's operating specifications.					
Achievement Indicators:		The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing P.C.V. system -				_____	_____
2. Checked all hoses for proper connections -				_____	_____
3. Inspected P.C.V. hoses for cracks and clogging -				_____	_____
4. Removed air cleaner and checked crank case ventilation filter -				_____	_____
5. Performed one of the following P.C.V. tests with engine running:					
a. vacuum test -				_____	_____
b. engine speed drop test -				_____	_____
c. P.C.V. tester -				_____	_____
d. infra-red test -				_____	_____
6. Replaced all defective components -				_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and P.C.V. system is tested according to manufacturer's specifications.					
Tools and Equipment: Basic Tool Set Tachometer P.C.V. Tester Infra-Red		Resources:			

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																					
		Task No. 2																																					
Task: Replace P.C.V. valve using appropriate equipment to restore P.C.V. valve operation.																																							
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Achievement Indicators:	The learner:	Yes	No																																				
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8. Started engine and checked for proper operation -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and P.C.V. valve is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G	
		Task No. 3	
Task: Replace P.C.V. valve hoses using appropriate equipment to restore P.C.V. valve hose operation.			
Achievement Indicators:		The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace P.C.V. valve hoses -		_____	_____
2. Disconnected defective P.C.V. hose -		_____	_____
3. Compared hose size, length and type of replacement hose (Note: P.C.V. hose must be used) -		_____	_____
4. Installed replacement hose -		_____	_____
5. Started engine -		_____	_____
6. Tested operation of P.C.V. system -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and P.C.V. hoses are replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																													
		Task No. 4																													
Task: Replace vacuum hoses using appropriate equipment to restore vacuum hose operation.																															
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Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																	
		Task No. 5																																	
Task: Test idle solenoid using appropriate equipment to detect any deviation from manufacturer's operation specifications.																																			
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Tools and Equipment: Basic Tool Set	Resources:																																		

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																													
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Task: Replace idle solenoid using appropriate equipment to restore idle solenoid operation.																															
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Tools and Equipment: Basic Tool Set Tachometer		Resources:																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. 6																													
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Task: Test thermostatic air cleaner using appropriate equipment to detect any deviation from manufacturer's operating specifications.																															
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and thermostatic air cleaner is tested according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set Vacuum Pump Thermometer		Resources:																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. 6																					
		Task No. 8																					
Task: Adjust thermostatic air cleaner using appropriate equipment to restore thermostatic air cleaner operation.																							
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Tools and Equipment: Basic Tool Set Thermometer		Resources:																					

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. 6																																	
		Task No. 9																																	
Task: Replace thermostatic air cleaner using appropriate equipment to restore thermostatic air cleaner operation.																																			
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th><th>The learner:</th><th>Yes</th><th>No</th></tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing thermostatic air cleaner -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>2. Disconnected vacuum lines, P.C.V. hoses and fresh air ducts -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>3. Unscrewed wing nuts and lifted off air cleaner housing -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>4. Checked condition of gasket between air cleaner and air horn -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>5. Installed exact replacement air cleaner housing -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>6. Connected vacuum lines, P.C.V. hoses, and fresh air ducts -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>7. Checked operation of air cleaner -</td><td></td><td>_____</td><td>_____</td></tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing thermostatic air cleaner -		_____	_____	2. Disconnected vacuum lines, P.C.V. hoses and fresh air ducts -		_____	_____	3. Unscrewed wing nuts and lifted off air cleaner housing -		_____	_____	4. Checked condition of gasket between air cleaner and air horn -		_____	_____	5. Installed exact replacement air cleaner housing -		_____	_____	6. Connected vacuum lines, P.C.V. hoses, and fresh air ducts -		_____	_____	7. Checked operation of air cleaner -		_____	_____
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Tools and Equipment: Basic Tool Set		Resources: 																																	

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																					
		Task No. 10																																					
Task: Test exhaust gas recirculation valve using appropriate equipment to detect any deviation from manufacturer's operation specifications.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing exhaust gas recirculation valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected tachometer to engine -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Started engine and adjusted speed to 1500 R.P.M. -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Disconnected and plugged vacuum line to E.G.R. valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Applied vacuum to valve R.P.M. should drop 150 to 200 R.P.M. -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Checked for vacuum leaks in E.G.R. valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Inspected for plugged parts and loose adapter plates -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Replaced defective valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing exhaust gas recirculation valve -		_____	_____	2. Connected tachometer to engine -		_____	_____	3. Started engine and adjusted speed to 1500 R.P.M. -		_____	_____	4. Disconnected and plugged vacuum line to E.G.R. valve -		_____	_____	5. Applied vacuum to valve R.P.M. should drop 150 to 200 R.P.M. -		_____	_____	6. Checked for vacuum leaks in E.G.R. valve -		_____	_____	7. Inspected for plugged parts and loose adapter plates -		_____	_____	8. Replaced defective valve -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and exhaust gas recirculation valve is tested according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set Vacuum Pump Tachometer	Resources:																																						

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																					
		Task No. 11																																					
Task: Replace exhaust gas recirculation valve using appropriate equipment to restore exhaust gas recirculation valve operation.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace exhaust gas recirculation valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected vacuum lines from E.G.R. valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed E.G.R. valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Cleaned sealing surfaces and exhaust parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed E.G.R. valve and new gasket -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Torqued mounting screws -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected vacuum lines to E.G.R. valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Performed operational test on valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace exhaust gas recirculation valve -		_____	_____	2. Disconnected vacuum lines from E.G.R. valve -		_____	_____	3. Removed E.G.R. valve -		_____	_____	4. Cleaned sealing surfaces and exhaust parts -		_____	_____	5. Installed E.G.R. valve and new gasket -		_____	_____	6. Torqued mounting screws -		_____	_____	7. Connected vacuum lines to E.G.R. valve -		_____	_____	8. Performed operational test on valve -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and exhaust gas recirculation valve is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																									
		Task No. 12																									
Task: Test fuel evaporation system using appropriate equipment to detect any deviation from manufacturer's operating specifications.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing fuel evaporation system -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>2. Inspected all vacuum lines for deterioration, oil damage, cracks, or hardening.</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>3. Checked canister filter -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>4. Checked operation of fuel filter cap -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> <tr> <td>5. Replaced all defective components -</td> <td></td> <td align="center">_____</td> <td align="center">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing fuel evaporation system -		_____	_____	2. Inspected all vacuum lines for deterioration, oil damage, cracks, or hardening.		_____	_____	3. Checked canister filter -		_____	_____	4. Checked operation of fuel filter cap -		_____	_____	5. Replaced all defective components -		_____	_____
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Tools and Equipment: Basic Tool Set	Resources:																										

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																	
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Task: Replace closed system charcoal canister filter using appropriate equipment to restore closed system charcoal canister filter operation.																																			
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Tools and Equipment: Basic Tool Set		Resources: 																																	

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																	
		Task No. 14																																	
Task: Test vacuum advance/retard device using appropriate equipment to detect any deviation from manufacturer's operating specifications.																																			
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing vacuum advance/retard device -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected timing light if vehicle is to be tested in shop -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected vacuum gauge to the distributor part of the vacuum solenoid if you are going to test drive the vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Operated the vehicle according to manufacturer's test recommendations -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Checked system operation by observing timing marks or vacuum gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Compared readings to specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced defective components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing vacuum advance/retard device -		_____	_____	2. Connected timing light if vehicle is to be tested in shop -		_____	_____	3. Connected vacuum gauge to the distributor part of the vacuum solenoid if you are going to test drive the vehicle -		_____	_____	4. Operated the vehicle according to manufacturer's test recommendations -		_____	_____	5. Checked system operation by observing timing marks or vacuum gauge -		_____	_____	6. Compared readings to specifications -		_____	_____	7. Replaced defective components -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and vacuum advance/retard device is tested according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set Advance Meter Tachometer		Resources:																																	

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																													
		Task No. 15																													
Task: Replace vacuum advance/retard device using appropriate equipment to restore vacuum advance/retard device operation.																															
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and vacuum advance/retard device is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set Tachometer Timing Light Advance Meter		Resources:																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G	
		Task No. 16	
Task: Test electrical advance/retard device using appropriate equipment to detect any deviations from manufacturer's specifications.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing electrical advance/retard device -		_____	_____
2. Disconnected vacuum hoses and electrical connections -		_____	_____
3. Applied vacuum to port -		_____	_____
4. Energized the solenoid -		_____	_____
5. Checked for vacuum or denied vacuum to proper port -		_____	_____
6. Compared operation with specifications -		_____	_____
7. Replaced any defective unit -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electrical advance/retard device is tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Timing Light Vacuum Gauge	Resources:		

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																													
		Task No. 17																													
Task: Replace deceleration valve using appropriate equipment to restore deceleration valve operation.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing deceleration valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected vacuum lines and/or electrical lines from deceleration valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed the defective valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed the replacement valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Adjusted the deceleration valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Checked for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing deceleration valve -		_____	_____	2. Disconnected vacuum lines and/or electrical lines from deceleration valve -		_____	_____	3. Removed the defective valve -		_____	_____	4. Installed the replacement valve -		_____	_____	5. Adjusted the deceleration valve -		_____	_____	6. Checked for proper operation -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and deceleration valve is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set Infra-Red Analyzer Tachometer		Resources:																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. 6																																													
		Task No. 18																																													
Task: Test air injection system using appropriate equipment to detect any deviation from manufacturer's operating specifications.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th><th>The learner:</th><th>Yes</th><th>No</th></tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing air injection system -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>2. Checked drive belt tension and condition -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>3. Inspected all hoses for loose connections, cracking and burning -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>4. Started engine -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>5. Disconnected the hose at the pump side of check valve to check air flow -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>6. Increased speed to about 1500 R.P.M. (Note: Air flow should increase) -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>7. Inspected for exhaust gases leaking back through and checked valves -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>8. Tested gulp valve and diverter valve if provided -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>9. Replaced all defective components -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>10. Retested for proper operation -</td><td></td><td>_____</td><td>_____</td></tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing air injection system -		_____	_____	2. Checked drive belt tension and condition -		_____	_____	3. Inspected all hoses for loose connections, cracking and burning -		_____	_____	4. Started engine -		_____	_____	5. Disconnected the hose at the pump side of check valve to check air flow -		_____	_____	6. Increased speed to about 1500 R.P.M. (Note: Air flow should increase) -		_____	_____	7. Inspected for exhaust gases leaking back through and checked valves -		_____	_____	8. Tested gulp valve and diverter valve if provided -		_____	_____	9. Replaced all defective components -		_____	_____	10. Retested for proper operation -		_____	_____
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Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																													
		Task No. 19																																													
Task: Replace air pump using appropriate equipment to restore air pump operation .																																															
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and air pump is replaced according to manufacturer's specifications.																																															
Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																					
		Task No. 20																																					
Task: Replace diverter and anti-backfire valve using appropriate equipment to restore diverter and anti-backfire valve operation.																																							
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and diverter and anti-backfire valve is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G			
		Task No. 21			
Task: Test back pressure of exhaust system using appropriate equipment to detect any deviation from manufacturer's operating specifications.					
Achievement Indicators:		The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing back pressure of exhaust system -				_____	_____
2. Connected tachometer to engine -				_____	_____
3. Connected vacuum gauge to intake manifold vacuum source -				_____	_____
4. Started engine and slowly opened the throttle until engine speed reached 2000 R.P.M. -				_____	_____
5. Observed vacuum reading (Note: Excessive back pressure will cause vacuum reading to be five or more inches below normal, and returns slowly and unevenly -				_____	_____
6. Disconnected exhaust pipe or pipes at exhaust manifold -				_____	_____
7. Repeated test if readings were normal and exhaust was restricted -				_____	_____
8. Replaced defective exhaust components -				_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and back pressure is tested according to manufacturer's specifications.					
Tools and Equipment: Basic Tool Set Tachometer Vacuum Gauge		Resources:			

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																									
		Task No. 22																																									
Task: Replace catalytic converter using appropriate equipment to restore catalytic converter operation.																																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th><th>The learner:</th><th>Yes</th><th>No</th></tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing catalytic converter -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>2. Raised and supported the vehicle -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>3. Removed any heat shields -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>4. Removed converter flange from front and rear -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>5. Separated and removed the converter to inlet and exhaust pipe -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>6. Aligned upper heat shields and converter to inlet and exhaust pipe -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>7. Attached lower heat shields -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>8. Aligned all parts and tightened all nuts and bolts to specifications -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>9. Lowered the car, started engine and checked for system leakage -</td><td></td><td>_____</td><td>_____</td></tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing catalytic converter -		_____	_____	2. Raised and supported the vehicle -		_____	_____	3. Removed any heat shields -		_____	_____	4. Removed converter flange from front and rear -		_____	_____	5. Separated and removed the converter to inlet and exhaust pipe -		_____	_____	6. Aligned upper heat shields and converter to inlet and exhaust pipe -		_____	_____	7. Attached lower heat shields -		_____	_____	8. Aligned all parts and tightened all nuts and bolts to specifications -		_____	_____	9. Lowered the car, started engine and checked for system leakage -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and catalytic converter is replaced according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set		Resources: 																																									

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G	
		Task No. 23	
Task: Test emission control system using propane enrichment apparatus to detect speed changes exceeding manufacturer's specifications.			
Achievement Indicators:		The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to test carburetor adjustment using propane enrichment -		_____	_____
2. Connected tachometer to engine -		_____	_____
3. Checked ignition timing and adjusted to specifications -		_____	_____
4. Adjusted idle speed to specified idle mixture adjusting speed -		_____	_____
5. Connected propane enrichment tool to engine -		_____	_____
6. Opened propane valve slowly until max idle speed was reached -		_____	_____
7. Compared reading to specifications -		_____	_____
8. Readjusted mixture screws to specifications if readings did not compare to specifications. -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and emission control system is tested according to manufacturer's specifications using propane enrichment.			
Tools and Equipment: Basic Tool Set Propane Enrichment Tool Tachometer		Resources:	

Duty: Certification: Engine Tune-up (Emission Control System)		Duty No. G																																													
		Task No. 24																																													
Task: Replace beads in catalytic converter using appropriate equipment to restore catalytic converter operation .																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing beads in catalytic converter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Attached aspirator to the tailpipe -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed the converter drain and filled plug -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Attached vibrator and catalyst container to converter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed the old pellets and discarded -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Filled vibrator container with replacement pellets -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Turned on the vibrator and aspirator to fill converter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Removed the vibrator and aspirator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed converter drain and filled plug -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Started engine and checked for leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing beads in catalytic converter -		_____	_____	2. Attached aspirator to the tailpipe -		_____	_____	3. Removed the converter drain and filled plug -		_____	_____	4. Attached vibrator and catalyst container to converter -		_____	_____	5. Removed the old pellets and discarded -		_____	_____	6. Filled vibrator container with replacement pellets -		_____	_____	7. Turned on the vibrator and aspirator to fill converter -		_____	_____	8. Removed the vibrator and aspirator -		_____	_____	9. Installed converter drain and filled plug -		_____	_____	10. Started engine and checked for leaks -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and beads are replaced according to manufacturer's specifications.																																															
Tools and Equipment: Basic Tool Set Aspirator Vibrator	Resources:																																														

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 1																									
Task: Test battery electrolyte level using appropriate equipment to detect any deviation from manufacturer's specifications.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test battery electrolyte level -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed vent caps -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked fluid level to split ring -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Adjusted electrolyte level with distilled water -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced vent caps -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test battery electrolyte level -		_____	_____	2. Removed vent caps -		_____	_____	3. Checked fluid level to split ring -		_____	_____	4. Adjusted electrolyte level with distilled water -		_____	_____	5. Replaced vent caps -		_____	_____
Achievement Indicators:	The learner:	Yes	No																								
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4. Adjusted electrolyte level with distilled water -		_____	_____																								
5. Replaced vent caps -		_____	_____																								
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and battery electrolyte level is tested according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H
		Task No. 2
Task: Test battery using hydrometer to detect any cell with specific gravity less than 1.220.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to test battery using hydrometer -		_____
2. Removed vent caps -		_____
3. Measured and recorded specific gravity and temperature of each cell -		_____
4. Adjusted reading to temperature -		_____
5. Recorded any cell less than 1.220 -		_____
6. Installed vent caps -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and battery is tested using hydrometer according to manufacturer's specifications to detect any cell less than 1.220.		
Tools and Equipment: Basic Tool Set Hydrometer	Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																													
		Task No. 3																													
Task: Test battery for surface leakage using appropriate equipment to detect any surface leakage.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test battery for surface leakage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected negative voltmeter lead to ground side of battery -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Ran positive voltmeter lead to top of battery -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Measure surface leakage (.02 volts max) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Compared meter readings with specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Cleaned surface of battery if readings exceeded specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test battery for surface leakage -		_____	_____	2. Connected negative voltmeter lead to ground side of battery -		_____	_____	3. Ran positive voltmeter lead to top of battery -		_____	_____	4. Measure surface leakage (.02 volts max) -		_____	_____	5. Compared meter readings with specifications -		_____	_____	6. Cleaned surface of battery if readings exceeded specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
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5. Compared meter readings with specifications -		_____	_____																												
6. Cleaned surface of battery if readings exceeded specifications -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and battery surface leakage is tested according to manufacturer's specifications.																															
Tools and Equipment: Voltmeter	Resources:																														

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 4																									
Task: Test battery voltage using appropriate equipment to detect a low voltage condition.																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test battery voltage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected voltmeter in parallel with battery -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Measured voltage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Recorded any readings that were below manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test battery voltage -		_____	_____	2. Connected voltmeter in parallel with battery -		_____	_____	3. Measured voltage -		_____	_____	4. Compared with manufacturer's specifications -		_____	_____	5. Recorded any readings that were below manufacturer's specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																								
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4. Compared with manufacturer's specifications -		_____	_____																								
5. Recorded any readings that were below manufacturer's specifications -		_____	_____																								
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and battery voltage is tested according to manufacturer's specifications.																											
Tools and Equipment: Voltmeter		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																									
		Task No. 5																																									
Task: Test battery capacity (load) using appropriate equipment to detect any deviation from manufacturer's specifications.																																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing battery capacity -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Tested voltage and specific gravity -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected voltmeter ampmeter and carbon pile load to battery -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Referred to battery maker's specifications to determine proper load ;</td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. multiplied the ampere-hour rating by three -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td> b. divided cold cranking rating by two -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Turned carbon pile control knob to draw battery current established in step no. 4 for 15 seconds -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Checked voltmeter during test (battery voltage should not fall below 9.6 V for 12 volts or 4.8 V for 6 volt battery) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Recharged or replaced battery as required -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing battery capacity -		_____	_____	2. Tested voltage and specific gravity -		_____	_____	3. Connected voltmeter ampmeter and carbon pile load to battery -		_____	_____	4. Referred to battery maker's specifications to determine proper load ;				a. multiplied the ampere-hour rating by three -		_____	_____	b. divided cold cranking rating by two -		_____	_____	5. Turned carbon pile control knob to draw battery current established in step no. 4 for 15 seconds -		_____	_____	6. Checked voltmeter during test (battery voltage should not fall below 9.6 V for 12 volts or 4.8 V for 6 volt battery) -		_____	_____	7. Recharged or replaced battery as required -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																								
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7. Recharged or replaced battery as required -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and battery capacity is tested according to manufacturer's specifications to detect deviation from manufacturer's specifications.																																											
Tools and Equipment: Voltmeter Ampmeter Carbon Pile Load Battery Tester		Resources:																																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																	
		Task No. 6																																	
Task: Clean battery post and cable connections using appropriate equipment to remove corrosion and foreign material.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to clean battery post and cable connections -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed ground cable from battery post -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed positive cable from battery post -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Cleaned posts and cables with wire brush -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed positive cable on positive post -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed negative cable on negative post -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Protected connections with approved sealer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to clean battery post and cable connections -		_____	_____	2. Removed ground cable from battery post -		_____	_____	3. Removed positive cable from battery post -		_____	_____	4. Cleaned posts and cables with wire brush -		_____	_____	5. Installed positive cable on positive post -		_____	_____	6. Installed negative cable on negative post -		_____	_____	7. Protected connections with approved sealer -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
1. Referred to manufacturer's repair manual for correct procedure to clean battery post and cable connections -		_____	_____																																
2. Removed ground cable from battery post -		_____	_____																																
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6. Installed negative cable on negative post -		_____	_____																																
7. Protected connections with approved sealer -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and battery post and cable are cleaned according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set Wire Brush		Resources:																																	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 7	
Task: Test ground system resistance using appropriate equipment to detect ground system resistance.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test ground system resistance -		_____	_____
2. Connected remote started switch -		_____	_____
3. Connected voltmeter positive lead to starter motor housing -		_____	_____
4. Connected voltmeter negative lead to negative battery terminal -		_____	_____
5. Cranked engine and noted voltmeter reading -		_____	_____
6. Compared voltmeter reading to specifications (usually .1 to .3 volts) -		_____	_____
7. Replaced or cleaned and tightened all system ground connections if reading exceeded specifications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and ground system resistance is tested according to manufacturer's specifications.			
Tools and Equipment: Voltmeter		Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 8	
Task: Replace battery cables using appropriate equipment to restore battery cable operation .			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing battery cables -		_____	_____
2. Removed terminal from battery post (negative then positive) -		_____	_____
3. Removed old cable -		_____	_____
4. Cleaned all contact surfaces -		_____	_____
5. Installed new cable -		_____	_____
6. Tightened all clamps and contact points -		_____	_____
7. Reinstalled battery terminals to battery posts (positive then negative) -		_____	_____
8. Protected connections with approved sealer -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and battery cable is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set	Resources:		

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 9	
Task: Charge battery using appropriate equipment to restore battery charge .			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to charge battery -		_____	_____
2. Checked electrolyte level and adjusted as required -		_____	_____
3. Disconnected battery cables (negative then positive) -		_____	_____
4. Cleaned battery terminals and top -		_____	_____
5. Determined present state of charge -		_____	_____
6. Determined charging rate and time -		_____	_____
7. Connected battery charger and set rate and time -		_____	_____
8. Checked charging rate and electrolyte temperature (120°F max) -		_____	_____
9. Turned charge off when proper voltage and specific gravity was within specifications -		_____	_____
10. Disconnected battery charger -		_____	_____
11. Reconnected battery cables (positive then negative) -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and battery is charged according to manufacturer's specifications so voltage and specific gravity is within manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Voltmeter Hydrometer Battery Charger	Resources:		

Duty: Certification: Electrical Systems (Electrical)	Duty No. H	
	Task No. 10	
Task: Test charging system output using appropriate equipment to detect any deviation from manufacturer's specifications for output.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to test charging system -		_____
2. Referred to vehicle manufacturer's service information to determine specifications for charging circuit -		_____
3. Referred to test equipment manufacturer operating instruction to determine testing procedure -		_____
4. Tested belt tension -		_____
5. Connected charging system test to vehicle -		_____
6. Read rate of discharge on ampmeter with engine off and ignition switch on -		_____
7. Started engine and adjusted speed to manufacturer's specifications -		_____
8. Adjusted load control slowly as required to obtain highest ampere reading -		_____
9. Added manufacturer's readings in steps no. 5 and 7 and compared to manufacturer's specifications -		_____
10. Repeated steps 5-9 with field energized if readings were not within specifications -		_____
11. Replaced charging unit if charging system failed test no. 9 -		_____
12. Replaced regulator if charging system passes test no. 9 -		_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and charging system output is tested according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Charging System Analyzer

Resources:

Duty: Certification: Electrical Systems (Electrical)	Duty No. H
	Task No. 11

Task: Test generator output using appropriate equipment to detect any deviation from manufacturer's specifications for output.

Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test generator output -		_____	_____
2. Referred to vehicle manufacturer's service information to determine specifications for charging circuit -		_____	_____
3. Referred to test equipment manufacturer operating instruction to determine testing procedure -		_____	_____
4. Tested belt tension -		_____	_____
5. Connected charging system test to vehicle -		_____	_____
6. Read rate of discharge on ammeter with engine off ignition switch on -		_____	_____
7. Started engine and adjusted speed to manufacturer's specifications -		_____	_____
8. Adjusted load control slowly as required to obtain highest ampere reading -		_____	_____
9. Added ammeter readings in steps no. 5 and 7 -		_____	_____
10. Compared to manufacturer's specifications (10% of specifications) -		_____	_____
11. Repeated steps 5-9 with field energized if readings were not within specifications -		_____	_____
12. Replaced generator if charging system fails test no. 10 -		_____	_____
13. Replaced regulator if charging system passes test no. 10 -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and generator output is tested according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Charging System Analyzer

Resources:

Duty: Certification: Electrical Systems (Electrical)	Duty No. H																																																				
Task No. 12																																																					
Task: Test alternator output using appropriate equipment to detect any deviation from manufacturer's specifications for output.																																																					
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 40%;">Achievement Indicators:</th> <th style="text-align: left; width: 30%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing alternator output -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Referred to vehicle manufacturer service information to determine testing procedure -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Referred to test equipment manufacturer operating instruction to determine testing procedure -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Connected charging system test to vehicle -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Read rate of discharge on ampmeter with engine off and ignition switch on -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Started engine and adjusted speed to manufacturer's specifications -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Adjusted load control slowly as required to obtain highest ampere reading -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Added ampmeter readings in steps no. 5 and 7 -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Compared to manufacturer's specifications (10% of specifications) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Repeated steps 5-9 with field energized if readings were not within specifications -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Replaced alternator if charging system fails test no. 10 -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Replaced regulator if charging system passes test no. 10 -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing alternator output -		_____	_____	2. Referred to vehicle manufacturer service information to determine testing procedure -		_____	_____	3. Referred to test equipment manufacturer operating instruction to determine testing procedure -		_____	_____	4. Connected charging system test to vehicle -		_____	_____	5. Read rate of discharge on ampmeter with engine off and ignition switch on -		_____	_____	6. Started engine and adjusted speed to manufacturer's specifications -		_____	_____	7. Adjusted load control slowly as required to obtain highest ampere reading -		_____	_____	8. Added ampmeter readings in steps no. 5 and 7 -		_____	_____	9. Compared to manufacturer's specifications (10% of specifications) -		_____	_____	10. Repeated steps 5-9 with field energized if readings were not within specifications -		_____	_____	11. Replaced alternator if charging system fails test no. 10 -		_____	_____	12. Replaced regulator if charging system passes test no. 10 -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and alternate output is tested according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Charging System Analyzer

Resources:

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																													
		Task No. 13																																													
Task: Replace generator or alternator using appropriate equipment to restore generator or alternator operation.																																															
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Tools and Equipment: Advanced Tool Set Charging System Analyzer		Resources:																																													

Duty: Certification: Electrical Systems (Electrical)	Duty No. H																																																
Task No. 14																																																	
Task: Rebuild generator using appropriate equipment to restore generator operation.																																																	
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and generator is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Charging System Analyzer
Armature Tester
Ohmmeter

Resources:

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 15	
Task: Rebuild alternator using appropriate equipment to restore alternator operation.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to rebuild alternator -		_____	_____
2. Removed four case frame bolts and scribed aligning marks -		_____	_____
3. Separated drive end frame and rotor from stator assembly by prying screwdriver lightly -		_____	_____
4. Checked to be sure separation was between stator frame and drive end frame -		_____	_____
5. Placed tape over slip ring or brush end frame bearing to seal it from dirt -		_____	_____
6. Lightly clamped rotor in vise to remove shaft nut and was sure not to overtighten vise and damage rotor -		_____	_____
7. Removed nut from rotor shaft, took off washer, pulley, fan, and collar or spacer -		_____	_____
8. Separated drive end frame from rotor shaft -		_____	_____
9. Removed three stator lead attaching nuts and separated stator -		_____	_____
10. Removed screws, brushes and holder assembly -		_____	_____
11. Removed battery, ground, and attaching screw terminal then removed heat sink -		_____	_____
12. Tested bearings and replaced if necessary -		_____	_____
13. Tested diodes and replaced if necessary -		_____	_____
14. Tested rotor for grounded, opened or shorted field coils -		_____	_____
15. Checked stator windings for grounded, opened or shorted windings -		_____	_____
16. Checked slip rings if they were rough or out-of-round -		_____	_____
17. Checked brushes and replaced if necessary -		_____	_____

The learner:

Yes

No

18. Reassembled alternator reversed procedures -

19. Checked regular performance before installing alternator
or generator -

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and alternator is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Charging System Analyzer
Ohmmeter

Resources:

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																													
		Task No. 16																																													
Task: Replace charging system alternator using appropriate equipment to restore charging system alternator operation.																																															
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Tools and Equipment: Advanced Tool Set Charging System Analyzer		Resources:																																													

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																								
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Task: Test starter control circuit using appropriate equipment to detect resistance outside manufacturer's specifications.																																										
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Tools and Equipment: Basic Tool Set Voltmeter		Resources:																																								

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																									
		Task No. 18																																									
Task: Test starter current draw using appropriate equipment to detect current draw that exceeds manufacturer's specifications.																																											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual correct procedure to test starter current draw -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Referred to test equipment manufacturer's operating instructions to determine testing procedure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Turned off all lights and accessories and closed all doors -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Connected tester leads to vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Disconnected ignition switch lead from ignition system to prevent starting -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Cranked engine while observing voltmeter and ampmeter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Compared readings with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Performed voltage drop test if readings exceed specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Replaced or repaired any defective component -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual correct procedure to test starter current draw -		_____	_____	2. Referred to test equipment manufacturer's operating instructions to determine testing procedure -		_____	_____	3. Turned off all lights and accessories and closed all doors -		_____	_____	4. Connected tester leads to vehicle -		_____	_____	5. Disconnected ignition switch lead from ignition system to prevent starting -		_____	_____	6. Cranked engine while observing voltmeter and ampmeter -		_____	_____	7. Compared readings with manufacturer's specifications -		_____	_____	8. Performed voltage drop test if readings exceed specifications -		_____	_____	9. Replaced or repaired any defective component -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and starter current draw is tested according to manufacturer's specifications.																																											
Tools and Equipment: Advanced Tool Set Starting System Analyzer		Resources:																																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																													
		Task No. 19																																													
Task: Replace starter solenoid using appropriate equipment to restore starter solenoid operation.																																															
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing starter solenoid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected negative (-) battery cable -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical leads from starter and solenoid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed starter assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed solenoid from starter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed replacement solenoid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed starter assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Connected electrical leads to starter and solenoid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Connected negative (-) battery cable -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Started engine to check operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing starter solenoid -		_____	_____	2. Disconnected negative (-) battery cable -		_____	_____	3. Disconnected electrical leads from starter and solenoid -		_____	_____	4. Removed starter assembly -		_____	_____	5. Removed solenoid from starter -		_____	_____	6. Installed replacement solenoid -		_____	_____	7. Installed starter assembly -		_____	_____	8. Connected electrical leads to starter and solenoid -		_____	_____	9. Connected negative (-) battery cable -		_____	_____	10. Started engine to check operation -		_____	_____
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Tools and Equipment: Advanced Tool Set		Resources:																																													

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																	
		Task No. 20																																	
Task: Test electrical motors using appropriate equipment to detect current draw and RPM outside manufacturer's specifications..																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. - Referred to manufacturer's repair manual for correct procedure to test electrical motors -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Connected ammeter in series with electric motor -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Started electric motor -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Measured amperage draw -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Measured RPM with tachometer -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Compared readings to manufacturer's specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Replaced or repaired electric motor if readings exceeded specifications -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. - Referred to manufacturer's repair manual for correct procedure to test electrical motors -		☐	☐	2. Connected ammeter in series with electric motor -		☐	☐	3. Started electric motor -		☐	☐	4. Measured amperage draw -		☐	☐	5. Measured RPM with tachometer -		☐	☐	6. Compared readings to manufacturer's specifications -		☐	☐	7. Replaced or repaired electric motor if readings exceeded specifications -		☐	☐
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Tools and Equipment: Ampmeter Tachometer Volt Meter		Resources:																																	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																											
		Task No. 21																																											
Task: Replace starter using appropriate equipment to restore starter operation.																																													
<table border="0"> <tr> <th rowspan="2">Achievement Indicators:</th> <th rowspan="2">The learner:</th> <th>Yes</th> <th>No</th> </tr> <tr> <th></th> <th></th> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace starter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected negative (-) battery cable -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed electrical connections from starter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed starter and shims if present -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected flywheel ring gear for damage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed new starter and shims if present -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected electrical connections to starter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Connected negative (-) battery cable -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Tested operation of replacement starter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No			1. Referred to manufacturer's repair manual for correct procedure to replace starter -		_____	_____	2. Disconnected negative (-) battery cable -		_____	_____	3. Removed electrical connections from starter -		_____	_____	4. Removed starter and shims if present -		_____	_____	5. Inspected flywheel ring gear for damage -		_____	_____	6. Installed new starter and shims if present -		_____	_____	7. Connected electrical connections to starter -		_____	_____	8. Connected negative (-) battery cable -		_____	_____	9. Tested operation of replacement starter -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and starter is replaced according to manufacturer's specifications.																																													
Tools and Equipment: Basic Tool Set		Resources:																																											

Duty: Certification: Electrical Systems (Electrical)	Duty No. H																																																																																				
Task No. 22																																																																																					
Task: Rebuild starter using appropriate equipment to restore starter operation.																																																																																					
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 40%;">Achievement Indicators:</th> <th style="text-align: left; width: 30%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to rebuild starter -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Removed solenoid from starter if applicable -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Removed brush cover band if applicable -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Removed through bolts -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed starter motor commutator end frame -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed field frame assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Removed shift lever, pivot bolt, plunger, shift lever and armature from drive housing -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Removed overrunning clutch from armature -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Cleaned armature, field coils and overrunning clutch with clean air brush and shop towels (do not clean with solvent) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Cleaned remaining parts with solvent and air dried -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Replaced end-frame and drive-housing bearings -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Inspected and tested armature for shorts -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Checked brush holders for grounds and spring tension -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Checked field coils for shorts and opens -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>15. Checked overrunning clutch -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>16. Replaced or serviced all worn or defective parts -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>17. Lubricated and installed overrunning clutch -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>18. Lubricated drive housing bushing and shift lever linkage -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>19. Installed armature with spacers in drive housing -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>20. Installed brushes and leads in brush holders -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to rebuild starter -		_____	_____	2. Removed solenoid from starter if applicable -		_____	_____	3. Removed brush cover band if applicable -		_____	_____	4. Removed through bolts -		_____	_____	5. Removed starter motor commutator end frame -		_____	_____	6. Removed field frame assembly -		_____	_____	7. Removed shift lever, pivot bolt, plunger, shift lever and armature from drive housing -		_____	_____	8. Removed overrunning clutch from armature -		_____	_____	9. Cleaned armature, field coils and overrunning clutch with clean air brush and shop towels (do not clean with solvent) -		_____	_____	10. Cleaned remaining parts with solvent and air dried -		_____	_____	11. 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The learner:

Yes No

- | | | |
|---|-------|-------|
| 21. Lubricated bushing and installed commutator end frame - | _____ | _____ |
| 22. Checked armature end play - | _____ | _____ |
| 23. Installed solenoid if provided - | _____ | _____ |
| 24. Tested starter for proper operation - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and starter is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Armature Tester
Ohmmeter

Resources:

?

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																								
		Task No. 23																								
Task: Test switches using appropriate equipment to detect resistance outside manufacturer's specifications.																										
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test switches -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Performed voltage drop test on switch in use on vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Performed continuity test with an ohmmeter for testing switch out of vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared readings with specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced defective components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test switches -		_____	_____	2. Performed voltage drop test on switch in use on vehicle -		_____	_____	3. Performed continuity test with an ohmmeter for testing switch out of vehicle -		_____	_____	4. Compared readings with specifications -		_____	_____	5. Replaced defective components -		_____	_____
Achievement Indicators:	The learner:	Yes	No																							
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5. Replaced defective components -		_____	_____																							
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and switches are tested according to manufacturer's specifications.																										
Tools and Equipment: Voltmeter Ohmmeter	Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 24	
Task: Replace switches using appropriate equipment to restore switch operation.			
Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct -		_____	_____
2. Disconnected negative (-) battery cable -		_____	_____
3. Disconnected electrical leads from switch -		_____	_____
4. Removed switch -		_____	_____
5. Installed replacement switch -		_____	_____
6. Connected electrical leads to replacement switch -		_____	_____
7. Connected negative (-) battery cable -		_____	_____
8. Tested operation of switch -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and switch is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 25																					
Task: Test fuses using appropriate equipment to detect open fuses.																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing fuses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed fuse from holder -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked for continuity with ohmmeter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Replaced fuses if they were open -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing fuses -		_____	_____	2. Removed fuse from holder -		_____	_____	3. Checked for continuity with ohmmeter -		_____	_____	4. Replaced fuses if they were open -		_____	_____
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4. Replaced fuses if they were open -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and fuses are tested according to manufacturer's specifications.																							
Tools and Equipment: Ohmmeter	Resources:																						

Duty: Certification: Electrical Systems (Electrical)		Duty No. H
		Task No. 26
Task: Replace fuses using appropriate equipment to restore fuse operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace fuses -		_____
2. Removed fuse from holder -		_____
3. Selected proper replacement fuse -		_____
4. Installed replacement fuse -		_____
5. Checked for proper operation -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and fuses are replaced according to manufacturer's specifications.		
Tools and Equipment: Fuse Puller	Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 27																									
Task: Test circuit breakers using appropriate equipment to detect circuit breakers opening outside of manufacturer's specifications.																											
<table border="0"> <thead> <tr> <th style="text-align: left;">Achievement Indicators:</th> <th style="text-align: left;">The learner:</th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing circuit breakers -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Connected circuit breaker in series with ammeter and adjustable carbon pile resistor -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Adjusted load slowly until circuit breaker broke circuit-</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Compared amperage reading with amperage rating of circuit breaker -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Replaced circuit breaker which did not meet manufacturer's specifications -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing circuit breakers -		_____	_____	2. Connected circuit breaker in series with ammeter and adjustable carbon pile resistor -		_____	_____	3. Adjusted load slowly until circuit breaker broke circuit-		_____	_____	4. Compared amperage reading with amperage rating of circuit breaker -		_____	_____	5. Replaced circuit breaker which did not meet manufacturer's specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																								
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and circuit breaker is tested according to manufacturer's specifications.																											
Tools and Equipment: Ampmeter Variable Load Control		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 28																					
Task: Replace circuit breakers using appropriate equipment to restore circuit breaker operation .																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th><th>The learner:</th><th>Yes</th><th>No</th></tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace circuit breakers -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>2. Disconnected circuit breaker from electrical source -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>3. Selected replacement circuit breaker with equal rating -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>4. Installed new circuit breaker -</td><td></td><td>_____</td><td>_____</td></tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace circuit breakers -		_____	_____	2. Disconnected circuit breaker from electrical source -		_____	_____	3. Selected replacement circuit breaker with equal rating -		_____	_____	4. Installed new circuit breaker -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and circuit breaker is replaced according to manufacturer's specifications.																							
Tools and Equipment: Basic Tool Set		Resources:																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																									
		Task No. 29																																									
Task: Replace fuse block assembly using appropriate equipment to restore fuse block assembly operation .																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace fuse block assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected battery cables from battery -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected fuse block from automobile -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Disconnected wire leads from fuse block -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Determined cause of problem in fuse block -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Repaired fuse block or replaced if necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reconnected wire leads to fuse block and attached block to vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reconnected battery cables -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Tested fuse block for proper functioning -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace fuse block assembly -		_____	_____	2. Disconnected battery cables from battery -		_____	_____	3. Disconnected fuse block from automobile -		_____	_____	4. Disconnected wire leads from fuse block -		_____	_____	5. Determined cause of problem in fuse block -		_____	_____	6. Repaired fuse block or replaced if necessary -		_____	_____	7. Reconnected wire leads to fuse block and attached block to vehicle -		_____	_____	8. Reconnected battery cables -		_____	_____	9. Tested fuse block for proper functioning -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and fuse block assembly is replaced according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set	Resources:																																										

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																				
		Task No. 30																																				
Task: Test lighting system using appropriate equipment to detect faulty bulbs.																																						
Achievement Indicators:	The learner:	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;"></th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 10%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing lighting system -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Visually inspected operation of the following:</td> <td></td> <td></td> </tr> <tr> <td> a. Parking lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> b. Head lights (both high and low beams) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> c. Tail lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> d. Turn signal lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> e. Brake lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> f. Marker lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> g. Clearance lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> h. Backup lights -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td> i. License plate light -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing lighting system -	_____	_____	2. Visually inspected operation of the following:			a. Parking lights -	_____	_____	b. Head lights (both high and low beams) -	_____	_____	c. Tail lights -	_____	_____	d. Turn signal lights -	_____	_____	e. Brake lights -	_____	_____	f. Marker lights -	_____	_____	g. Clearance lights -	_____	_____	h. Backup lights -	_____	_____	i. License plate light -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and lighting system is tested according to manufacturer's specifications.																																						
Tools and Equipment: None	Resources:																																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																													
		Task No. 31																													
Task: Replace light bulbs using appropriate equipment to restore light bulbs.																															
<table border="0"> <tr> <td>Achievement Indicators:</td><td>The learner:</td><td>Yes</td><td>No</td></tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing light bulbs -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>2. Removed necessary components to gain access to light bulbs-</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>3. Removed light bulb -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>4. Cleaned light bulb socket -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>5. Installed replacement light bulb -</td><td></td><td>_____</td><td>_____</td></tr> <tr> <td>6. Installed necessary components removed to gain access to bulbs -</td><td></td><td>_____</td><td>_____</td></tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing light bulbs -		_____	_____	2. Removed necessary components to gain access to light bulbs-		_____	_____	3. Removed light bulb -		_____	_____	4. Cleaned light bulb socket -		_____	_____	5. Installed replacement light bulb -		_____	_____	6. Installed necessary components removed to gain access to bulbs -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and light bulbs are replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set		Resources:																													

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																	
		Task No. 32																																	
Task: Replace bulb sockets using appropriate equipment to restore bulb socket operation.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace bulb sockets -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed components necessary to gain access to bulb sockets -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed light bulb socket and disconnected electrical leads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed light bulb socket -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Reconnected electrical leads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed components necessary to gain access to bulb sockets -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked operation of replacement light socket -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace bulb sockets -		_____	_____	2. Removed components necessary to gain access to bulb sockets -		_____	_____	3. Removed light bulb socket and disconnected electrical leads -		_____	_____	4. Installed light bulb socket -		_____	_____	5. Reconnected electrical leads -		_____	_____	6. Installed components necessary to gain access to bulb sockets -		_____	_____	7. Checked operation of replacement light socket -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and light socket is replaced according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set		Resources:																																	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 33	
Task: Adjust headlights using appropriate equipment to restore headlight adjustment.			
Achievement Indicators:		The learner:	
		Yes	No
1.	Referred to manufacturer's repair manual for correct procedure to adjust headlights -	_____	_____
2.	Referred to test equipment manufacturer's adjustment procedure -	_____	_____
3.	Placed vehicle on level surface with wheels straight ahead-	_____	_____
4.	Removed retainer ring(s) from headlight beam(s) and secured in safe manner -	_____	_____
5.	Adjusted high and low beam of headlights in accordance with manufacturer's specifications -	_____	_____
6.	Replaced retainer ring(s) on headlight beam(s) and secured in safe manner -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and headlights are adjusted according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Headlight Aimer		Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 34																					
Task: Test parking light and headlight circuit using appropriate equipment to detect circuit resistance outside manufacturer's specifications.																							
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Tools and Equipment: Basic Tool Set Voltmeter		Resources:																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																													
		Task No. 35																																													
Task: Replace dimmer switch using appropriate equipment to restore dimmer switch operation.																																															
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Task: Test turn signal circuit using appropriate equipment to detect circuit resistance outside manufacturer's specification.																											
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Task: Replace turn signal switch using appropriate equipment to restore turn signal operation.																																															
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Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
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Task: Adjust back up light switch using appropriate equipment to restore back up light operation.																											
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Tools and Equipment: Basic Tool Set		Resources:																									

Duty: Certification: Electrical systems (Electrical)		Duty No. H																																									
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Tools and Equipment: Basic Tool Set	Resources:																																										

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
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Task: Adjust stop light switch using appropriate equipment to restore stop light switch operation.																											
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Tools and Equipment: Basic Tool Set		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H
		Task No. 41
Task: Replace stop light switch using appropriate equipment to restore stop light operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace stop light switch -		_____
2. Disconnected electrical leads from switch -		_____
3. Removed switch -		_____
4. Installed switch (hydraulic operated switch brakes must be bled) -		_____
5. Connected electrical leads to switch -		_____
6. Adjusted switch -		_____
7. Checked operation of switch -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and stop light switch is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 42																					
Task: Test horn circuit using appropriate equipment to detect resistance outside manufacturer's specifications.																							
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2. Performed voltage drop test on all components, switches, contacts and relays to detect excessive resistance -		_____	_____																				
3. Compared voltage readings to specifications -		_____	_____																				
4. Replaced or repaired all switches, contacts, connections, components, that had excessive resistance -		_____	_____																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and horn circuit is tested according to manufacturer's specifications to detect excessive resistance.																							
Tools and Equipment: Basic Tool Set Voltmeter		Resources:																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 43																									
Task: Test horn relay using appropriate equipment to detect operation outside of manufacturer's specifications.																											
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and horn relay is tested according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set Voltmeter		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																													
		Task No. 44																													
Task: Replace horn relay using appropriate equipment to restore horn operation.																															
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and horn relay is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 45																									
Task: Test windshield wiper circuit using appropriate equipment to detect resistance outside manufacturer's specifications.																											
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and windshield wiper circuit is tested according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set Voltmeter Ampmeter		Resources:																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																					
		Task No. 46																																					
Task: Replace windshield wiper motor using appropriate equipment to restore windshield wiper operation.																																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace windshield wiper motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed any components to gain access to wiper motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical leads and washer hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed wiper motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement wiper motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Connected electrical leads and washer hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed any components removed to gain access to wiper motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Tested for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace windshield wiper motor -		_____	_____	2. Removed any components to gain access to wiper motor -		_____	_____	3. Disconnected electrical leads and washer hoses -		_____	_____	4. Removed wiper motor -		_____	_____	5. Installed replacement wiper motor -		_____	_____	6. Connected electrical leads and washer hoses -		_____	_____	7. Installed any components removed to gain access to wiper motor -		_____	_____	8. Tested for proper operation -		_____	_____
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7. Installed any components removed to gain access to wiper motor -		_____	_____																																				
8. Tested for proper operation -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and windshield wiper motor is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																													
		Task No. 47																													
Task: Replace windshield washer motor using appropriate equipment to restore windshield washer operation.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace windshield washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads and hoses from washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed replacement washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Connected electrical leads and hoses to washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Tested operation of washer motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace windshield washer motor -		_____	_____	2. Disconnected electrical leads and hoses from washer motor -		_____	_____	3. Removed washer motor -		_____	_____	4. Installed replacement washer motor -		_____	_____	5. Connected electrical leads and hoses to washer motor -		_____	_____	6. Tested operation of washer motor -		_____	_____
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6. Tested operation of washer motor -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and washer motor is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 48																					
Task: Test constant voltage regulator using appropriate equipment to detect operation outside manufacturer's specifications.																							
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Achievement Indicators:	The learner:	Yes	No																				
1. Referred to manufacturer's repair manual for correct procedure to test constant voltage regulator -		_____	_____																				
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and constant voltage regulator is tested according to manufacturer's specifications.																							
Tools and Equipment: Voltmeter	Resources:																						

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																													
		Task No. 49																													
Task: Replace constant voltage regulator using appropriate equipment to restore constant voltage regulator operation.																															
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and constant voltage regulator is replaced according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set Voltmeter		Resources:																													

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																					
		Task No. 50																					
Task: Test instrument gauges using appropriate equipment to detect operation outside manufacturer's specifications.																							
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Tools and Equipment: Basic Tool Set	Resources:																						

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																					
		Task No. 51																																					
Task: Replace instrument gauges using appropriate equipment to restore instrument gauge operation.																																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace instrument gauges -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed all components necessary to gain access to instrument gauges -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical leads from gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Connected electrical leads to gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reinstalled all components necessary to gain access to gauges -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked operation of gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace instrument gauges -		_____	_____	2. Removed all components necessary to gain access to instrument gauges -		_____	_____	3. Disconnected electrical leads from gauge -		_____	_____	4. Removed gauge -		_____	_____	5. Installed replacement gauge -		_____	_____	6. Connected electrical leads to gauge -		_____	_____	7. Reinstalled all components necessary to gain access to gauges -		_____	_____	8. Checked operation of gauge -		_____	_____
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Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																									
		Task No. 52																									
Task: Test sending units using appropriate equipment to detect operation outside manufacturer's specifications.																											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to test sending units -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Measured resistance of variable resistance units, (removed any voltage source) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Replaced sending unit with new sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared operation with specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced defective sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test sending units -		_____	_____	2. Measured resistance of variable resistance units, (removed any voltage source) -		_____	_____	3. Replaced sending unit with new sending unit -		_____	_____	4. Compared operation with specifications -		_____	_____	5. Replaced defective sending unit -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and sending units are tested according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set Ohmmeter		Resources: 																									

Duty: Certification: Electrical Systems (Electrical)		Duty No. H																																									
		Task No. 53																																									
Task: Replace sending units using appropriate equipment to restore sending unit operation.																																											
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing sending units -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads from unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Drained any fluids below level of sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed defective sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Refilled fluid levels to proper height -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected electrical leads to unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Started engine and checked operation of sending unit -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Checked for any fluids leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing sending units -		_____	_____	2. Disconnected electrical leads from unit -		_____	_____	3. Drained any fluids below level of sending unit -		_____	_____	4. Removed defective sending unit -		_____	_____	5. Installed replacement sending unit -		_____	_____	6. Refilled fluid levels to proper height -		_____	_____	7. Connected electrical leads to unit -		_____	_____	8. Started engine and checked operation of sending unit -		_____	_____	9. Checked for any fluids leaks -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																								
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and sending units are replaced according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set	Resources:																																										

Duty: Certification: Electrical Systems (Electrical)		Duty No. H
		Task No. 54
Task: Test warning lamps using appropriate equipment to detect operation outside manufacturer's specifications.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test warning lamps -	_____	_____
2. Performed operational inspection of warning lamps -	_____	_____
3. Checked all unlit lights with ohmmeter-	_____	_____
4. Replaced all defective bulbs -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and warning lamps are tested according to manufacturer's specifications.		
Tools and Equipment: Ohmmeter	Resources:	

Duty: Certification: Electrical Systems (Electrical)		Duty No. H	
		Task No. 55	
Task: Replace warning lamps using appropriate equipment to restore warning lamp operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace warning lamps -		_____	_____
2. Removed defective lamp -		_____	_____
3. Installed new lamp -		_____	_____
4. Checked operation of warning lamps -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and warning lamp is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I																																	
		Task No. 1																																	
Task: Test cruise control unit using appropriate equipment to detect operation outside of manufacturer's specifications.																																			
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing cruise control unit -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Checked servo cable or rod adjustment -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Checked vacuum hoses for kinks, leaks and damage -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Checked throttle linkage or cable for binding -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Checked adjustment of brake release switch and vacuum release valve -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Tested for electrical power to system -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Checked engagement switch operation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Tested transducer -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Repaired, replaced or adjusted defective components -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Test drove car -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing cruise control unit -	_____	_____	2. Checked servo cable or rod adjustment -	_____	_____	3. Checked vacuum hoses for kinks, leaks and damage -	_____	_____	4. Checked throttle linkage or cable for binding -	_____	_____	5. Checked adjustment of brake release switch and vacuum release valve -	_____	_____	6. Tested for electrical power to system -	_____	_____	7. Checked engagement switch operation -	_____	_____	8. Tested transducer -	_____	_____	9. Repaired, replaced or adjusted defective components -	_____	_____	10. Test drove car -	_____	_____
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9. Repaired, replaced or adjusted defective components -	_____	_____																																	
10. Test drove car -	_____	_____																																	
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cruise control unit is tested according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set	Resources:																																		

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 2	
Task: Replace cruise control components using appropriate equipment to restore cruise control operations.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace cruise control components -		_____	_____
2. Disconnected electrical leads or vacuum lines -		_____	_____
3. Removed the defective component -		_____	_____
4. Installed the replacement component -		_____	_____
5. Connected all electrical leads and/or vacuum lines -		_____	_____
6. Adjusted component if necessary -		_____	_____
7. Test drove car -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cruise control components are replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I																
		Task No. 3																
Task: Test automatic alarm system using appropriate equipment to detect operation outside of manufacturer's specifications.																		
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure for testing automatic alarm system - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Performed operational check of system - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Checked each component if operation check failed - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Replaced defective components - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing automatic alarm system -	_____	_____	2. Performed operational check of system -	_____	_____	3. Checked each component if operation check failed -	_____	_____	4. Replaced defective components -	_____	_____
Achievement Indicators: The learner:	Yes	No																
1. Referred to manufacturer's repair manual for correct procedure for testing automatic alarm system -	_____	_____																
2. Performed operational check of system -	_____	_____																
3. Checked each component if operation check failed -	_____	_____																
4. Replaced defective components -	_____	_____																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and automatic alarm system is tested according to manufacturer's specifications.																		
Tools and Equipment: Basic Tool Set	Resources:																	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 4	
Task: Replace automatic alarm system components using appropriate equipment to restore automatic alarm system operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing automatic alarm system components -		_____	_____
2. Disconnected electrical leads from components -		_____	_____
3. Removed the defective component -		_____	_____
4. Installed the replacement component -		_____	_____
5. Connected electrical lead to component -		_____	_____
6. Performed operational test on system -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and automatic alarm system components are replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I
		Task No. 5
Task: Test radio power circuit using appropriate equipment to detect operation outside of manufacturer's specifications.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing radio power circuit -	_____	_____
2. Checked radio fuse and replaced if defective -	_____	_____
3. Checked for battery voltage at radio power lead -	_____	_____
4. Repaired or replaced power lead if voltage was not present -	_____	_____
5. Checked for battery voltage after repair -	_____	_____
6. Performed operational check on radio -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio power circuit is tested according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set Volt Meter Test Light	Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. 1	
		Task No. 6	
Task: Test radio speaker using appropriate equipment to detect all cracks or separations.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing radio speaker -		_____	_____
2. Visually inspected speaker for cracks -		_____	_____
3. Disconnected speaker wires from radio -		_____	_____
4. Checked resistance with ohmmeter -		_____	_____
5. Compared with specifications -		_____	_____
6. Replaced defective speaker -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio speaker is tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Ohmmeter		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I																															
		Task No. 7																															
Task: Replace radio speaker using appropriate equipment to restore radio speaker operation.																																	
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing radio speaker -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed necessary components to gain access to speaker -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected speaker leads -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed defective speaker -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement speaker -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Torqued mounting nuts to specifications to prevent distortion -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Connected speaker leads -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed components removed to gain access to speaker -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Performed operational check on speaker -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing radio speaker -	_____	_____	2. Removed necessary components to gain access to speaker -	_____	_____	3. Disconnected speaker leads -	_____	_____	4. Removed defective speaker -	_____	_____	5. Installed replacement speaker -	_____	_____	6. Torqued mounting nuts to specifications to prevent distortion -	_____	_____	7. Connected speaker leads -	_____	_____	8. Installed components removed to gain access to speaker -	_____	_____	9. Performed operational check on speaker -	_____	_____
Achievement Indicators: The learner:	Yes	No																															
1. Referred to manufacturer's repair manual for correct procedure for replacing radio speaker -	_____	_____																															
2. Removed necessary components to gain access to speaker -	_____	_____																															
3. Disconnected speaker leads -	_____	_____																															
4. Removed defective speaker -	_____	_____																															
5. Installed replacement speaker -	_____	_____																															
6. Torqued mounting nuts to specifications to prevent distortion -	_____	_____																															
7. Connected speaker leads -	_____	_____																															
8. Installed components removed to gain access to speaker -	_____	_____																															
9. Performed operational check on speaker -	_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio speaker is replaced according to manufacturer's specifications.																																	
Tools and Equipment: Basic Tool Set	Resources:																																

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 8	
Task: Test radio antenna using appropriate equipment to detect resistance outside manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing radio antenna -		_____	_____
2. Measured resistance between cable end and base -		_____	_____
3. Measured resistance between center cable and ground -		_____	_____
4. Measured resistance between mast and base -		_____	_____
5. Measured resistance between mast and center cable -		_____	_____
6. Compared with specifications -		_____	_____
7. Replaced defective components -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio antenna is tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Ohmmeter		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I
		Task No. 9
Task: Replace radio antenna using appropriate equipment to restore radio antenna operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing radio antenna -	_____	_____
2. Removed base attaching screws -	_____	_____
3. Disconnected the antenna lead from the radio -	_____	_____
4. Removed radio antenna -	_____	_____
5. Installed replacement antenna -	_____	_____
6. Connected the antenna lead to the radio -	_____	_____
7. Attached mounting screws -	_____	_____
8. Performed operational check of radio -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio antenna is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I												
		Task No. 10												
Task: Adjust radio antenna using appropriate equipment to restore radio volume.														
Achievement Indicators: The learner: 1. Referred to manufacturer's repair manual for correct procedure to adjust radio antenna - 2. Tuned radio to weak AM station near 1400 KH2 - 3. Turned the volume all the way up - 4. Extended fender mounted antenna - 5. Adjusted trimmer screw for loudest volume -		<table> <tr> <th>Yes</th> <th>No</th> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Yes	No													
_____	_____													
_____	_____													
_____	_____													
_____	_____													
_____	_____													
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radio antenna is adjusted according to manufacturer's specifications.														
Tools and Equipment: Basic Tool Set	Resources:													

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. 1	
		Task No. 11	
Task: Replace power antenna using appropriate equipment to restore power antenna operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing power antenna -		_____	_____
2. Disconnected negative (-) battery cable -		_____	_____
3. Removed necessary body panels to gain access to power antenna -		_____	_____
4. Disconnected electrical leads and antenna lead to radio -		_____	_____
5. Removed power antenna -		_____	_____
6. Installed replacement power antenna -		_____	_____
7. Connected electrical leads and antenna lead -		_____	_____
8. Installed body panels removed to gain access to power antenna -		_____	_____
9. Connected negative (-) battery cable -		_____	_____
10. Checked operation of power antenna -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and power antenna is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 12	
Task: Replace power window motors using appropriate equipment to restore power window operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing power window motor -		_____	_____
2. Removed any door panels to gain access to motor -		_____	_____
3. Disconnected electrical leads to motor -		_____	_____
4. Removed power window motor -		_____	_____
5. Installed replacement motor -		_____	_____
6. Connected electrical leads to motor -		_____	_____
7. Tested window movement -		_____	_____
8. Replaced any panels removed to gain access to motor -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and power window motors are replaced according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 13	
Task: Replace power seat motors using appropriate equipment to restore power seat operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing power seat motors - - -		_____	_____
2. Removed components necessary to gain access to power seat motors -		_____	_____
3. Disconnected electrical leads -		_____	_____
4. Removed power seat motor -		_____	_____
5. Installed power seat motor -		_____	_____
6. Connected electrical leads -		_____	_____
7. Reinstalled any components removed to gain access to motors -		_____	_____
8. Performance tested power seats -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and power seat motors are replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Electrical Sytems (Electrical Accessories)		Duty No. I	
		Task No. 14	
Task: Test cigarette lighter circuit using appropriate equipment to detect resistance outside of manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing cigarette lighter circuit -		_____	_____
2. Removed cigarette lighter -		_____	_____
3. Measured resistance of heating coil -		_____	_____
4. Compared reading with specifications -		_____	_____
5. Replaced defective cigarette lighter -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cigarette lighter cicuit is tested according to manufacturer's specifications.			
Tools and Equipment: Ohmmeter		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I																						
		Task No. 15																						
Task: Replace cigarette lighter receptacle using appropriate equipment restore cigarette lighter operation.																								
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure for replacing cigarette lighter receptacle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Disconnected electrical lead to receptacle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed receptacle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Installed replacement receptacle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Connected electrical lead to receptacle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Tested operation of lighter - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing cigarette lighter receptacle -	_____	_____	2. Disconnected electrical lead to receptacle -	_____	_____	3. Removed receptacle -	_____	_____	4. Installed replacement receptacle -	_____	_____	5. Connected electrical lead to receptacle -	_____	_____	6. Tested operation of lighter -	_____	_____
Achievement Indicators: The learner:	Yes	No																						
1. Referred to manufacturer's repair manual for correct procedure for replacing cigarette lighter receptacle -	_____	_____																						
2. Disconnected electrical lead to receptacle -	_____	_____																						
3. Removed receptacle -	_____	_____																						
4. Installed replacement receptacle -	_____	_____																						
5. Connected electrical lead to receptacle -	_____	_____																						
6. Tested operation of lighter -	_____	_____																						
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cigarette lighter receptacle is replaced according to manufacturer's specifications.																								
Tools and Equipment: Basic Tool Set		Resources:																						

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 16	
Task: Test rear window defogger circuit using appropriate equipment to detect resistance outside of manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing rear window defogger circuit -		_____	_____
2. Disconnected leads from grid -		_____	_____
3. Measured resistance of grid -		_____	_____
4. Compared with specifications -		_____	_____
5. Tested relay and switch for proper operation -		_____	_____
6. Repaired or replaced defective unit -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and rear window defogger circuit is tested according to manufacturer's specifications.			
Tools and Equipment: Ohmmeter		Resources:	

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I																													
		Task No. 17																													
Task: Test power trunk mechanism using appropriate equipment to detect resistance outside of manufacturer's specifications.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2">1. Referred to manufacturer's repair manual for correct procedure for testing power trunk mechanism -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">2. Disconnected negative battery cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">3. Measured resistance of switch -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">4. Measured resistance of power trunk solenoid -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">5. Compared with specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">6. Replaced any defective components -</td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing power trunk mechanism -		_____	_____	2. Disconnected negative battery cable -		_____	_____	3. Measured resistance of switch -		_____	_____	4. Measured resistance of power trunk solenoid -		_____	_____	5. Compared with specifications -		_____	_____	6. Replaced any defective components -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure for testing power trunk mechanism -		_____	_____																												
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3. Measured resistance of switch -		_____	_____																												
4. Measured resistance of power trunk solenoid -		_____	_____																												
5. Compared with specifications -		_____	_____																												
6. Replaced any defective components -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and power trunk mechanism is tested according to manufacturer's specifications.																															
Tools and Equipment: Ohmmeter		Resources:																													

Duty: Certification: Electrical Systems (Electrical Accessories)		Duty No. I	
		Task No. 18	
Task: Replace power trunk mechanism using appropriate equipment to restore power trunk operation.			
Achievement Indicators: The learner:			
		Yes	No
1.	Referred to manufacturer's repair manual for correct procedure for replacing power trunk mechanism -	_____	_____
2.	Removed any panels to gain access to mechanism -	_____	_____
3.	Disconnected electrical leads -	_____	_____
4.	Removed the power trunk mechanism -	_____	_____
5.	Installed power trunk mechanism -	_____	_____
6.	Connected electrical leads -	_____	_____
7.	Installed any panels removed to gain access to mechanism -	_____	_____
8.	Checked operation of power lock -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and power trunk mechanism is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																					
		Task No. 1																																					
Task: Test brake operation using appropriate equipment to detect any deviations.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Checked master cylinder fluid level, condition and signs of leakage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked power brake booster for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked brake pedal height and brake pedal operation for bleed down, free play, excessive travel and mushiness -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked emergency brake for length of travel and proper release -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Checked brake warning and brake lights for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Drove vehicle forward and applied brakes -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked for erratic brake action, squeal, pull to one side pedal pulsation and wheel vibration -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Recorded results -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Checked master cylinder fluid level, condition and signs of leakage -		_____	_____	2. Checked power brake booster for proper operation -		_____	_____	3. Checked brake pedal height and brake pedal operation for bleed down, free play, excessive travel and mushiness -		_____	_____	4. Checked emergency brake for length of travel and proper release -		_____	_____	5. Checked brake warning and brake lights for proper operation -		_____	_____	6. Drove vehicle forward and applied brakes -		_____	_____	7. Checked for erratic brake action, squeal, pull to one side pedal pulsation and wheel vibration -		_____	_____	8. Recorded results -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																				
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5. Checked brake warning and brake lights for proper operation -		_____	_____																																				
6. Drove vehicle forward and applied brakes -		_____	_____																																				
7. Checked for erratic brake action, squeal, pull to one side pedal pulsation and wheel vibration -		_____	_____																																				
8. Recorded results -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions from manufacturer's specifications on braking performance are detected.																																							
Tools and Equipment:		Resources:																																					

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																	
		Task No. 2																																	
Task: Test brake hose, lines, and fittings using appropriate equipment to detect any leaking, kinked or cracked hoses, lines or fittings.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Checked master cylinder fluid level; adjusted if necessary -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Started engine and applied brakes with force -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Checked for any bleed down or loss of brake pedal height -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>4. Raised and supported vehicle -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5. Visually inspected all brake lines, fittings and hoses for any signs of leakage- damage, kinks and cracks -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6. Repaired if necessary (NOTE: Be sure to bleed brakes if any line is replaced) -</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7. Lowered vehicle and tested brake operation -</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Checked master cylinder fluid level; adjusted if necessary -				2. Started engine and applied brakes with force -				3. Checked for any bleed down or loss of brake pedal height -				4. Raised and supported vehicle -				5. Visually inspected all brake lines, fittings and hoses for any signs of leakage- damage, kinks and cracks -				6. Repaired if necessary (NOTE: Be sure to bleed brakes if any line is replaced) -				7. Lowered vehicle and tested brake operation -			
Achievement Indicators:	The learner:	Yes	No																																
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6. Repaired if necessary (NOTE: Be sure to bleed brakes if any line is replaced) -																																			
7. Lowered vehicle and tested brake operation -																																			
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake hoses, lines and fittings are tested according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set		Resources:																																	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J	
		Task No. 3	
Task: Flush brake system using appropriate equipment to restore brake fluid operation.			
Achievement Indicators: The learner:		Yes	No
1. Raised and supported vehicle -		_____	_____
2. Loosened all bleeder screws -		_____	_____
3. Removed all old brake fluid from master cylinder -		_____	_____
4. Refilled with denatured alcohol or fluid recommended by vehicle manufacturer -		_____	_____
5. Flushed braking system by forcing fluid through braking system until fluid flow is clear -		_____	_____
6. Added new brake fluid recommended by vehicle manufacturer -		_____	_____
7. Bled brakes to remove flushing fluid and air -		_____	_____
8. Inspected for leaks -		_____	_____
9. Lowered vehicle to floor -		_____	_____
10. Checked brake fluid level and brake operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a braking system is flushed according to manufacturer's specifications and with fluid flow clear and no evidence of contamination or air.			
Tools and Equipment: Basic Tool Set Pressure Bleeder		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. ✓																																																				
		Task No. 4																																																				
Task: Replace brake hose using appropriate equipment to restore brake hose operation .																																																						
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised and supported vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected brake line from hose -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed hose retaining clamp -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed hose from wheel cylinder or caliper -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed new hose at wheel cylinder or caliper -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed brake line to new hose -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Aligned hose, tightened fitting and installed clamp -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Bled brakes -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Checked pedal height and feel -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Inspected for leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Lowered vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Checked brake operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Raised and supported vehicle -		_____	_____	2. Disconnected brake line from hose -		_____	_____	3. Removed hose retaining clamp -		_____	_____	4. Removed hose from wheel cylinder or caliper -		_____	_____	5. Installed new hose at wheel cylinder or caliper -		_____	_____	6. Installed brake line to new hose -		_____	_____	7. Aligned hose, tightened fitting and installed clamp -		_____	_____	8. Bled brakes -		_____	_____	9. Checked pedal height and feel -		_____	_____	10. Inspected for leaks -		_____	_____	11. Lowered vehicle -		_____	_____	12. Checked brake operation -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																																			
1. Raised and supported vehicle -		_____	_____																																																			
2. Disconnected brake line from hose -		_____	_____																																																			
3. Removed hose retaining clamp -		_____	_____																																																			
4. Removed hose from wheel cylinder or caliper -		_____	_____																																																			
5. Installed new hose at wheel cylinder or caliper -		_____	_____																																																			
6. Installed brake line to new hose -		_____	_____																																																			
7. Aligned hose, tightened fitting and installed clamp -		_____	_____																																																			
8. Bled brakes -		_____	_____																																																			
9. Checked pedal height and feel -		_____	_____																																																			
10. Inspected for leaks -		_____	_____																																																			
11. Lowered vehicle -		_____	_____																																																			
12. Checked brake operation -		_____	_____																																																			
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake hoses are replaced according to manufacturer's specifications and so hoses are properly routed with no leaks or air in the hoses.																																																						
Tools and Equipment: Basic Tool Set		Resources:																																																				

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J	
		Task No. 5	
Task: Replace brake lines using appropriate equipment to restore brake line operation.			
Achievement Indicators: The learner:		Yes	No
1. Raised and supported vehicle -		_____	_____
2. Disconnected and removed brake line -		_____	_____
3. Fabricated new brake line from steel tubing using a tube bender to shape tubing -		_____	_____
4. Formed a double flair on end of tube (NOTE: Some vehicles may require a ball-type flair or fitting -		_____	_____
5. Installed brake line -		_____	_____
6. Bled system and checked for leaks -		_____	_____
7. Checked brake pedal height and feel -		_____	_____
8. Lowered car -		_____	_____
9. Checked brake operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake lines are replaced according to manufacturer's specifications and so lines are properly routed with no leaks or air in the lines.			
Tools and Equipment: Basic Tool Set Double Flairing Tool Tubing Cutter		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J	
		Task No. 6	
Task: Bleed brake system using appropriate equipment to restore brake operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for procedure to bleed brakes -		_____	_____
2. Raised and supported vehicle -		_____	_____
3. Inspected lines, fittings and hoses for leaks -		_____	_____
4. Filled master cylinder -		_____	_____
5. Adjusted service brakes if necessary -		_____	_____
6. Bled brakes (NOTE: Metering valve must be held open when using a pressure bleeder) -		_____	_____
7. Checked pedal height and feel -		_____	_____
8. Lowered car -		_____	_____
9. Rechecked master cylinder reservoir -		_____	_____
10. Inspected for leaks -		_____	_____
11. Checked brake operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and the braking system is bled according to manufacturer's specifications and so there is no air in the system and the pedal is firm.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																												
		Task No. 7																												
Task: Adjust brake shoes using appropriate equipment to restore brake shoe operation.																														
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for procedure to adjust brake shoes - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Raised and supported vehicle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed dust covers or plugs from access slots - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Adjusted brakes according to manufacturer's specifications - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Repeated procedure for all wheels - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Installed all dust covers or plugs - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Lowered vehicle to floor - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Checked operation of brakes making final adjustments if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to adjust brake shoes -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed dust covers or plugs from access slots -	_____	_____	4. Adjusted brakes according to manufacturer's specifications -	_____	_____	5. Repeated procedure for all wheels -	_____	_____	6. Installed all dust covers or plugs -	_____	_____	7. Lowered vehicle to floor -	_____	_____	8. Checked operation of brakes making final adjustments if necessary -	_____	_____
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8. Checked operation of brakes making final adjustments if necessary -	_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake shoes are adjusted according to manufacturer's specifications and so that vehicle does not pull and pressure is equal on all wheels.																														
Tools and Equipment: Basic Tool Set	Resources:																													

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J	
		Task No. 8	
Task: Free parking brake cable and linkage using appropriate equipment to restore parking brake operation.			
Achievement Indicators: The learner:			
		Yes	No
1. Raised and supported vehicle -		_____	_____
2. Disconnected cables; removed rear wheels as required -		_____	_____
3. Freed-up cables using lubricants as needed to assure easy movement -		_____	_____
4. Reconnected cables -		_____	_____
5. Adjusted parking brake cables -		_____	_____
6. Tested operation of parking brake -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and parking brake cable and linkage are freed according to manufacturer's specifications and so the brake does not bind.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																													
		Task No. 9																													
Task: Adjust parking brake linkage using appropriate equipment to restore parking brake operation																															
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Achievement Indicators:	The learner:	Yes	No																												
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6. Lowered vehicle to floor -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and parking brake linkage is adjusted according to manufacturer's specifications and so the brake will hold on a 10° incline and brakes do not drag when released.																															
Tools and Equipment: Basic Tool Set		Resources:																													

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																					
		Task No. 10																																					
Task: Replace parking brake cable and linkage using appropriate equipment to restore parking brake operation.																																							
<table border="1"> <thead> <tr> <th> Achievement Indicators: The learner: </th> <th> Yes </th> <th> No </th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure to replace parking brake cable and linkage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Placed parking pedal in release position -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. For rear cables, removed rear wheels, drums and brake shoes -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Disconnected cable ends at equalizer -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. For front cables, separated cable stud from equalizer. Removed end of cable from pedal clevis. Removed mounting bolts/clips and withdrew cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed brake shoes, pedal clevis and/or rear brake shoes -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed brake shoes, drums and wheel -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Adjusted parking brake cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Checked parking brake operation -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to replace parking brake cable and linkage -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Placed parking pedal in release position -	_____	_____	4. For rear cables, removed rear wheels, drums and brake shoes -	_____	_____	5. Disconnected cable ends at equalizer -	_____	_____	6. For front cables, separated cable stud from equalizer. Removed end of cable from pedal clevis. Removed mounting bolts/clips and withdrew cable -	_____	_____	7. Installed brake shoes, pedal clevis and/or rear brake shoes -	_____	_____	8. Installed brake shoes, drums and wheel -	_____	_____	9. Adjusted parking brake cable -	_____	_____	10. Checked parking brake operation -	_____	_____	11. Lowered vehicle to floor -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and parking brake cable and linkage are replaced according to manufacturer's specifications and so the brake will hold on a 10° incline and brakes do not drag when released.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																					
		Task No. 11																																					
Task: Replace parking brake external band using appropriate equipment to restore parking brake operation.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2">1. Referred to manufacturer's repair manual for correct procedure to replace parking brake external band -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">3. Disconnected parking brake linkage and band mounting bolts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">4. Removed parking band -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">5. Installed external band and adjusted to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">6. Adjusted parking brake cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">7. Tested parking brake operation -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">8. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace parking brake external band -		_____	_____	2. Raised and supported vehicle -		_____	_____	3. Disconnected parking brake linkage and band mounting bolts -		_____	_____	4. Removed parking band -		_____	_____	5. Installed external band and adjusted to manufacturer's specifications -		_____	_____	6. Adjusted parking brake cable -		_____	_____	7. Tested parking brake operation -		_____	_____	8. Lowered vehicle to floor -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and parking brake external band is replaced according to manufacturer's specifications and so that brake will hold vehicle on a 10° incline and brakes do not drag when released.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Brakes (Brakes and Braking Systems)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No. J</td> </tr> <tr> <td style="padding: 2px 5px;">Task No. 12</td> </tr> </table>	Duty No. J	Task No. 12																																								
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Task: Replace brake shoes using appropriate equipment to restore brake operation.																																											
<table style="width: 100%;"> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators: The learner:</th> <th style="width: 10%;">Yes</th> <th style="width: 15%;">No</th> </tr> <tr><td>1. Raised and supported vehicle -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>2. Removed wheels and drums -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>3. Removed old brake shoes -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>4. Cleaned brake backing plates and lubricated backing plate pads -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>5. Checked wheel cylinder for leakage; rebuilt or replaced if necessary -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>6. Checked brake springs for discoloration, distortion, broken, weak and rust; replace if necessary -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>7. Checked self-adjuster cable guides and levers; replaced if necessary -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>8. Inspected and serviced brake drum if necessary -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>9. Installed brake shoes following proper procedures -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>10. Reinstalled drums and wheels and torqued lug nut to specifications -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>11. Adjusted brakes -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>12. Bled brakes and inspected for leaks -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>13. Road tested vehicle; made final brake adjustments -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> </table>		Achievement Indicators: The learner:	Yes	No	1. Raised and supported vehicle -	_____	_____	2. Removed wheels and drums -	_____	_____	3. Removed old brake shoes -	_____	_____	4. Cleaned brake backing plates and lubricated backing plate pads -	_____	_____	5. Checked wheel cylinder for leakage; rebuilt or replaced if necessary -	_____	_____	6. Checked brake springs for discoloration, distortion, broken, weak and rust; replace if necessary -	_____	_____	7. Checked self-adjuster cable guides and levers; replaced if necessary -	_____	_____	8. Inspected and serviced brake drum if necessary -	_____	_____	9. Installed brake shoes following proper procedures -	_____	_____	10. Reinstalled drums and wheels and torqued lug nut to specifications -	_____	_____	11. Adjusted brakes -	_____	_____	12. Bled brakes and inspected for leaks -	_____	_____	13. Road tested vehicle; made final brake adjustments -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake shoes are replaced according to manufacturer's specifications and so that shoes do not drag and wheel lug nuts are torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																					
		Task No. 13																																					
Task: Replace self-adjusters using appropriate equipment to restore self-adjuster operation.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace self-adjusters -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed all four or the two rear wheel assemblies -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed brake shoes, start-wheel adjuster, and self-adjusting mechanisms -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected, cleaned, and lubricated start-wheel adjusters, self-adjusting components and backing plate bosses -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed brake whoes and self-adjusters -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reinstalled drums and wheel -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Torqued wheel lug nuts to specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Adjusted brakes -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Checked brade pedal operation -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Checked brake operation -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace self-adjusters -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed all four or the two rear wheel assemblies -	_____	_____	4. Removed brake shoes, start-wheel adjuster, and self-adjusting mechanisms -	_____	_____	5. Inspected, cleaned, and lubricated start-wheel adjusters, self-adjusting components and backing plate bosses -	_____	_____	6. Installed brake whoes and self-adjusters -	_____	_____	7. Reinstalled drums and wheel -	_____	_____	8. Torqued wheel lug nuts to specifications -	_____	_____	9. Adjusted brakes -	_____	_____	10. Checked brade pedal operation -	_____	_____	11. Checked brake operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																																					
1. Referred to manufacturer's repair manual for correct procedure to replace self-adjusters -	_____	_____																																					
2. Raised and supported vehicle -	_____	_____																																					
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9. Adjusted brakes -	_____	_____																																					
10. Checked brade pedal operation -	_____	_____																																					
11. Checked brake operation -	_____	_____																																					
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and self-adjusters are replaced according to manufacturer's specifications and so wheel lug nuts are torqued.																																							
Tools and Equipment: Advanced Tool Set	Resources: 																																						

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																															
		Task No. 14																															
Task: Replace wheel cylinder using appropriate equipment to restore wheel cylinder operation.																																	
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to replace a wheel cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Raised and supported vehicle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed wheel assembly - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Removed brake shoes and disconnected hydraulic line to wheel cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Removed brake shoes and disconnected hydraulic line to wheel cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Installed new wheel cylinder and reassembled brake shoes and wheel assembly - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Checked brake adjustment and master cylinder fluid level - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Bled wheel cylinder and inspected for leaks - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 9. Checked brake pedal operator and road tested vehicle - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace a wheel cylinder -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed wheel assembly -	_____	_____	4. Removed brake shoes and disconnected hydraulic line to wheel cylinder -	_____	_____	5. Removed brake shoes and disconnected hydraulic line to wheel cylinder -	_____	_____	6. Installed new wheel cylinder and reassembled brake shoes and wheel assembly -	_____	_____	7. Checked brake adjustment and master cylinder fluid level -	_____	_____	8. Bled wheel cylinder and inspected for leaks -	_____	_____	9. Checked brake pedal operator and road tested vehicle -	_____	_____
Achievement Indicators: The learner:	Yes	No																															
1. Referred to manufacturer's repair manual for correct procedure to replace a wheel cylinder -	_____	_____																															
2. Raised and supported vehicle -	_____	_____																															
3. Removed wheel assembly -	_____	_____																															
4. Removed brake shoes and disconnected hydraulic line to wheel cylinder -	_____	_____																															
5. Removed brake shoes and disconnected hydraulic line to wheel cylinder -	_____	_____																															
6. Installed new wheel cylinder and reassembled brake shoes and wheel assembly -	_____	_____																															
7. Checked brake adjustment and master cylinder fluid level -	_____	_____																															
8. Bled wheel cylinder and inspected for leaks -	_____	_____																															
9. Checked brake pedal operator and road tested vehicle -	_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a wheel cylinder is replaced according to manufacturer's specifications and so there is no air in the system, braking is restored and lug nuts are torqued.																																	
Tools and Equipment: Advanced Tool Set		Resources:																															

Duty: Certification: Brakes (Brakes and Brake Systems)	Duty No. J		
Task No. 15			
Task: Rebuild wheel cylinder using appropriate equipment to restore wheel cylinder operation.			
Achievement Indicators: The learner:	<table style="margin: auto;"> <tr> <th style="width: 100px;">Yes</th> <th style="width: 100px;">No</th> </tr> </table>	Yes	No
Yes	No		
1. Referred to manufacturer's repair manual for proper procedure to rebuild a wheel cylinder (NOTE: Repair should be done on wheel set) -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
2. Removed bleeder screw -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
3. Drained wheel cylinder of all brake fluid in a waste can -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
4. Disassembled wheel cylinder, removing dust botts, pistons, hydraulic cups and springs -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
5. Cleaned and polished cylinder with crocus cloth and honed cylinder where allowed -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
6. Measured cylinder diameter and/or piston fit in accordance with car manufacturer's recommended specifications -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
7. Reassembled wheel cylinder installing new parts, cleaned bleeder screw, and reinstalled -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
8. Reinstalled wheel cylinder on vehicle -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
9. Reinstalled brake shoes, drum and wheel assembly -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
10. Bled brakes and inspected for leaks -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
11. Tested brake operation -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a wheel cylinder is rebuilt according to manufacturer's specifications and so the wheel cylinder does not leak.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																						
		Task No. 16																						
Task: Grind brake drum using appropriate equipment to restore drum operation.																								
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Located car manufacturer's service information for drum diameter specifications and drum lathe manufacturer's operating instruction manual - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Inspected brake drums and measured drum diameters - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Mounted drum to drum lathe - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Operate lathe in accordance to lathe manufacturer's procedures adhering to accepted safety practices - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Refinished drum to manufacturer's specifications - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Repeated above steps to refinish remaining drums - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Located car manufacturer's service information for drum diameter specifications and drum lathe manufacturer's operating instruction manual -	_____	_____	2. Inspected brake drums and measured drum diameters -	_____	_____	3. Mounted drum to drum lathe -	_____	_____	4. Operate lathe in accordance to lathe manufacturer's procedures adhering to accepted safety practices -	_____	_____	5. Refinished drum to manufacturer's specifications -	_____	_____	6. Repeated above steps to refinish remaining drums -	_____	_____
Achievement Indicators: The learner:	Yes	No																						
1. Located car manufacturer's service information for drum diameter specifications and drum lathe manufacturer's operating instruction manual -	_____	_____																						
2. Inspected brake drums and measured drum diameters -	_____	_____																						
3. Mounted drum to drum lathe -	_____	_____																						
4. Operate lathe in accordance to lathe manufacturer's procedures adhering to accepted safety practices -	_____	_____																						
5. Refinished drum to manufacturer's specifications -	_____	_____																						
6. Repeated above steps to refinish remaining drums -	_____	_____																						
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and brake drum is grinded according to manufacturer's specifications so that all wear marks are removed and drum thickness equals or exceeds specifications.																								
Tools and Equipment: Brake Drum Lathe		Resources:																						

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																									
		Task No. 17																									
Task: Recondition backing plate using appropriate equipment to restore backing plate operation.																											
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to recondition backing plate - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Raised and supported vehicle - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed wheels, drums and brake shoes; removed backing plates if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Reconditioned or dressed backing plate bosses - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Torqued mounting bolts - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Lubricated and reinstalled brake shoes and wheels - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Readjusted brakes and bled hydraulic system if required - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to recondition backing plate -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed wheels, drums and brake shoes; removed backing plates if necessary -	_____	_____	4. Reconditioned or dressed backing plate bosses -	_____	_____	5. Torqued mounting bolts -	_____	_____	6. Lubricated and reinstalled brake shoes and wheels -	_____	_____	7. Readjusted brakes and bled hydraulic system if required -	_____	_____
Achievement Indicators: The learner:	Yes	No																									
1. Referred to manufacturer's repair manual for correct procedure to recondition backing plate -	_____	_____																									
2. Raised and supported vehicle -	_____	_____																									
3. Removed wheels, drums and brake shoes; removed backing plates if necessary -	_____	_____																									
4. Reconditioned or dressed backing plate bosses -	_____	_____																									
5. Torqued mounting bolts -	_____	_____																									
6. Lubricated and reinstalled brake shoes and wheels -	_____	_____																									
7. Readjusted brakes and bled hydraulic system if required -	_____	_____																									
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and backing plate is reconditioned according to manufacturer's specifications and so that shoe contacts all platforms and all hardware is torqued.																											
Tools and Equipment: Advanced Tool Set	Resources:																										

Duty: Certification: Brakes (Brakes and Braking Systems)	Duty No. J																																													
	Task No. 18																																													
Task: Replace disc brake rotor using appropriate equipment to restore disc brake rotor operation.																																														
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 20%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace disc brake rotor -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Removed tire and wheel assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Removed caliper assembly (CAUTION: So not let caliper hang from brake hose) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed front wheel bearing, dust cap and bearing retainer -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed brake rotor -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Cleaned and inspected spindle -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Repacked wheel bearings -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Reinstalled brake rotor -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Adjusted wheel bearings -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Installed caliper assembly and torqued to specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Installed tire and wheel assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Lowered vehicle to floor -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Checked master cylinder fluid level; checked brake operation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace disc brake rotor -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed tire and wheel assembly -	_____	_____	4. Removed caliper assembly (CAUTION: So not let caliper hang from brake hose) -	_____	_____	5. Removed front wheel bearing, dust cap and bearing retainer -	_____	_____	6. Removed brake rotor -	_____	_____	7. Cleaned and inspected spindle -	_____	_____	8. Repacked wheel bearings -	_____	_____	9. Reinstalled brake rotor -	_____	_____	10. Adjusted wheel bearings -	_____	_____	11. Installed caliper assembly and torqued to specifications -	_____	_____	12. Installed tire and wheel assembly -	_____	_____	13. Lowered vehicle to floor -	_____	_____	14. Checked master cylinder fluid level; checked brake operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																																												
1. Referred to manufacturer's repair manual for correct procedure to replace disc brake rotor -	_____	_____																																												
2. Raised and supported vehicle -	_____	_____																																												
3. Removed tire and wheel assembly -	_____	_____																																												
4. Removed caliper assembly (CAUTION: So not let caliper hang from brake hose) -	_____	_____																																												
5. Removed front wheel bearing, dust cap and bearing retainer -	_____	_____																																												
6. Removed brake rotor -	_____	_____																																												
7. Cleaned and inspected spindle -	_____	_____																																												
8. Repacked wheel bearings -	_____	_____																																												
9. Reinstalled brake rotor -	_____	_____																																												
10. Adjusted wheel bearings -	_____	_____																																												
11. Installed caliper assembly and torqued to specifications -	_____	_____																																												
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13. Lowered vehicle to floor -	_____	_____																																												
14. Checked master cylinder fluid level; checked brake operation -	_____	_____																																												

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a disc rotor is replaced according to manufacturer's specifications and so that all hardware is torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																						
		Task No. 19																						
Task: Reface disc brake rotor using appropriate equipment to restore disc brake rotor operation.																								
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a disc brake rotor is refaced according to manufacturer's specifications.																								
Tools and Equipment: Disc Brake Lathe	Resources:																							

Duty: Certification: Brakes (Brakes and Braking Systems)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">J</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">20</td> </tr> </table>	Duty No.	J	Task No.	20																																												
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Task: Replace caliper assembly using appropriate equipment to restore caliper assembly operation.																																																	
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and caliper assembly is replaced according to manufacturer's specifications and so that all hardware is torqued and there is no air in the system.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																				
		Task No. 21																																				
Task: Rebuild caliper using appropriate equipment to restore caliper operation.																																						
<table border="1"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for rebuilding a caliper -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed brake fluid from caliper -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed piston using piston puller, air pressure or hydraulic pressure -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed dust seal and square cut seal -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected piston, bore for corrosion service or replaced as necessary -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Cleaned bore and piston -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed square cut seal piston and dust seal -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reinstalled pads, caliper assembly and brake line -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Bled caliper assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Reinstalled tire and wheel assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Checked for leaks and brake operation -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for rebuilding a caliper -	_____	_____	2. Removed brake fluid from caliper -	_____	_____	3. Removed piston using piston puller, air pressure or hydraulic pressure -	_____	_____	4. Removed dust seal and square cut seal -	_____	_____	5. Inspected piston, bore for corrosion service or replaced as necessary -	_____	_____	6. Cleaned bore and piston -	_____	_____	7. Installed square cut seal piston and dust seal -	_____	_____	8. Reinstalled pads, caliper assembly and brake line -	_____	_____	9. Bled caliper assembly -	_____	_____	10. Reinstalled tire and wheel assembly -	_____	_____	11. Checked for leaks and brake operation -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and caliper is rebuilt according to manufacturer's specifications and so caliper operates with no leaks.																																						
Tools and Equipment: Advanced Tool Set	Resources:																																					

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																														
		Task No. 22																														
Task: Replace master cylinder using appropriate equipment to restore master cylinder operation.																																
<table border="1"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised hood and installed protective fender covers -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected master cylinder, push rod from brake pedal and hydraulic brake line(s) when applicable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed mounting bolts and master cylinder from firewall or power assists -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Bench bled new master cylinder -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Filled to recommended fluid levels -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed master cylinder in reverse order -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked and adjusted brake pedal free play following manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked brake pedal operation -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Bled master cylinder line(s) and/or wheel cylinders, if necessary and inspected for leaks -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Raised hood and installed protective fender covers -	_____	_____	2. Disconnected master cylinder, push rod from brake pedal and hydraulic brake line(s) when applicable -	_____	_____	3. Removed mounting bolts and master cylinder from firewall or power assists -	_____	_____	4. Bench bled new master cylinder -	_____	_____	5. Filled to recommended fluid levels -	_____	_____	6. Installed master cylinder in reverse order -	_____	_____	7. Checked and adjusted brake pedal free play following manufacturer's specifications -	_____	_____	8. Checked brake pedal operation -	_____	_____	9. Bled master cylinder line(s) and/or wheel cylinders, if necessary and inspected for leaks -	_____	_____
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8. Checked brake pedal operation -	_____	_____																														
9. Bled master cylinder line(s) and/or wheel cylinders, if necessary and inspected for leaks -	_____	_____																														
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a master cylinder is replaced according to manufacturer's specifications and so that pedal is firm and connections do not leak.																																
Tools and Equipment: Basic Tool Set	Resources:																															

Duty: Certification: Brakes (Brakes and Braking Systems)

Duty No. J

Task No. 23

Task: Rebuild master cylinder using appropriate equipment to restore master cylinder operation.

Achievement Indicators:	The learner:	Yes	No
1. Raised hood and installed protective fender covers -		_____	_____
2. Disconnected master cylinder, push rod from brake pedal and hydraulic brake line(s) when applicable -		_____	_____
3. Removed mounting bolts and master cylinder from firewall on power assist -		_____	_____
4. Located car manufacturer's service information for repair procedures and specifications -		_____	_____
5. Drained master cylinder of brake fluid and disassembled master cylinder -		_____	_____
6. Cleaned and honed cylinder, checked proper piston fit, condition of bore and piston -		_____	_____
7. Installed new parts and reassembled master cylinder -		_____	_____
8. Filled with proper brake fluid and bench bled, if required -		_____	_____
9. Installed master cylinder in reverse order -		_____	_____
10. Checked and adjusted brake pedal free play following manufacturer's specifications -		_____	_____
11. Checked brake pedal operation -		_____	_____
12. Bled master cylinder line(s) and/or wheel cylinders, if necessary -		_____	_____
13. Inspected for leaks -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a master cylinder is rebuilt according to manufacturer's specifications and so the master cylinder does not leak.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J																																				
		Task No. 24																																				
Task: Replace hydraulic power assist unit using appropriate equipment to restore hydraulic power brake operation.																																						
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for procedure to replace hydraulic power brake unit - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Raised hood and installed protective fender covers - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Disconnected vacuum lines and removed vacuum check valve - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Removed master cylinder and positioned away from power cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Removed clevis pin retainer at brake pedal - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Removed power unit-to-dash attaching nuts - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Removed power unit - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Installed new power unit in reverse order and torqued all hardware - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 9. Checked brake pedal free play and adjusted if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 10. Checked brake pedal operation - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 11. Road tested vehicle - </td> <td> _____ </td> <td> _____ </td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to replace hydraulic power brake unit -	_____	_____	2. Raised hood and installed protective fender covers -	_____	_____	3. Disconnected vacuum lines and removed vacuum check valve -	_____	_____	4. Removed master cylinder and positioned away from power cylinder -	_____	_____	5. Removed clevis pin retainer at brake pedal -	_____	_____	6. Removed power unit-to-dash attaching nuts -	_____	_____	7. Removed power unit -	_____	_____	8. Installed new power unit in reverse order and torqued all hardware -	_____	_____	9. Checked brake pedal free play and adjusted if necessary -	_____	_____	10. Checked brake pedal operation -	_____	_____	11. Road tested vehicle -	_____	_____
Achievement Indicators: The learner:	Yes	No																																				
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10. Checked brake pedal operation -	_____	_____																																				
11. Road tested vehicle -	_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to supervisor's directions and hydraulic power brake unit is replaced according to manufacturer's specifications and so all hardware is torqued, pedal is firm and there is not fluid or vacuum leaks.																																						
Tools and Equipment: Advanced Tool Set	Resources:																																					

Duty: Certification: Brakes (Brakes and Braking Systems)	Duty No. J
	Task No. 25

Task: Replace hydro-brake booster unit using appropriate equipment to restore hydro-brake booster unit operation.

Achievement Indicators: The learner:

Yes No

- | | | |
|---|-------|-------|
| 1. Referred to manufacturer's repair manual for procedure to replace hydro-brake booster unit - | _____ | _____ |
| 2. Raised hood and installed protective fender covers - | _____ | _____ |
| 3. Disconnected pressure and return line from booster - | _____ | _____ |
| 4. Removed master cylinder and positioned away from power unit - | _____ | _____ |
| 5. Removed clevis pin retainer at brake pedal - | _____ | _____ |
| 6. Removed power unit-to-dash attaching nuts - | _____ | _____ |
| 7. Removed power unit - | _____ | _____ |
| 8. Installed new power unit in reverse order - | _____ | _____ |
| 9. Checked brake pedal free play and adjusted if necessary - | _____ | _____ |
| 10. Checked and refilled power steering reservoir - | _____ | _____ |
| 11. Inspected for leaks - | _____ | _____ |
| 12. Checked brake pedal operation - | _____ | _____ |
| 13. Road tested vehicle - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and hydro-brake booster unit is replaced according to manufacturer's specifications and so all hardware is torqued and pedal is firm with no fluid leaks.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J Task No. 26	
Task: Replace proportioning or metering valve (combination valve) using appropriate equipment to restore proportioning meter operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for procedure in replacing a proportioning or metering valve -		_____	_____
2. Raised and supported vehicle -		_____	_____
3. Disconnected hydraulic line(s) from defective hydraulic control valve and any electrical connections -		_____	_____
4. Removed mounting bolt(s) and valve from vehicle -		_____	_____
5. Installed new valve in reverse order -		_____	_____
6. Bled hydraulic line(s) at fittings -		_____	_____
7. Inspected for leaks -		_____	_____
8. Checked brake pedal operation -		_____	_____
9. Road tested vehicle for braking applications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and proportioning or metering valve is replaced according to manufacturer's specifications and so hydraulic lines do not leak.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J
		Task No. 27
Task: Test brake anti-lock system using appropriate equipment to detect any deviation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for procedure to test anti-lock system -	_____	_____
2. Road tested vehicle to check brake operation -	_____	_____
3. Brake vehicle from 35 mph to full stop -	_____	_____
4. Checked sensors, computer and actuator if lock-up occurs -	_____	_____
5. Replaced defective components -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and anti-lock system is tested according to manufacturer's specifications, so that brakes are firmly depressed, they do not lock up.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Brakes (Brakes and Braking Systems)		Duty No. J												
		Task No. 28												
Task: Replace brake anti-lock system components using appropriate equipment to restore brake anti-lock system operation.														
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Yes	No													
_____	_____													
_____	_____													
_____	_____													
_____	_____													
_____	_____													
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to supervisor's directions and brake anti-lock system components are replaced according to manufacturer's specifications.														
Tools and Equipment: Basic Tool Set	Resources:													

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																																	
		Task No. 1																																	
Task: Inspect steering gear using appropriate equipment to detect all parts worn beyond manufacturer's specification.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised vehicle so suspension was supported under outer ends of lower control arms -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Visually checked for sign of fluid leakage (seals, fittings and hoses.) Inspected mounting bolts, and bushings -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Grasped left front wheel and turned wheel in and out slowly through entire travel of steering gear (started engine for power steering) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked for excessive looseness, steering effort and roughness (NOTE: Turning wheel hard against its stops may damage steering gear.) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Checked gear adjustment by turning steering wheel slowly through its straight ahead position for signs of slight drag or looseness -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Lowered vehicle to floor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Moved steering wheel back and forth in a straight ahead position and checked for free play -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Raised vehicle so suspension was supported under outer ends of lower control arms -		_____	_____	2. Visually checked for sign of fluid leakage (seals, fittings and hoses.) Inspected mounting bolts, and bushings -		_____	_____	3. Grasped left front wheel and turned wheel in and out slowly through entire travel of steering gear (started engine for power steering) -		_____	_____	4. Checked for excessive looseness, steering effort and roughness (NOTE: Turning wheel hard against its stops may damage steering gear.) -		_____	_____	5. Checked gear adjustment by turning steering wheel slowly through its straight ahead position for signs of slight drag or looseness -		_____	_____	6. Lowered vehicle to floor -		_____	_____	7. Moved steering wheel back and forth in a straight ahead position and checked for free play -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and all parts worn beyond manufacturer's specifications are detected.																																			
Tools and Equipment: Floor Jack Safety Stands		Resources:																																	

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																								
		Task No. 2																								
Task: Inspect steering linkage using appropriate equipment to detect all parts worn beyond manufacturer's specifications.																										
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised vehicle so front wheels were off the ground -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Visually inspected all rubber dust shields and boots for damage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Pushed and pulled on all steering linkage parts and visually checked for excessive looseness -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Lowered vehicle to floor position with front wheels in the straight ahead position (for power steering, start engine and set parking brake) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Rotated steering wheel from side to side through one-quarter revolution from center -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Visually observed and inspected steering components for looseness while steering wheel was being turned -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked manufacturer's service manual to determine if linkage tolerance was within specifications -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Raised vehicle so front wheels were off the ground -	_____	_____	2. Visually inspected all rubber dust shields and boots for damage -	_____	_____	3. Pushed and pulled on all steering linkage parts and visually checked for excessive looseness -	_____	_____	4. Lowered vehicle to floor position with front wheels in the straight ahead position (for power steering, start engine and set parking brake) -	_____	_____	5. Rotated steering wheel from side to side through one-quarter revolution from center -	_____	_____	6. Visually observed and inspected steering components for looseness while steering wheel was being turned -	_____	_____	7. Checked manufacturer's service manual to determine if linkage tolerance was within specifications -	_____	_____
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Tools and Equipment: Floor Jack Vehicle Safety Stands	Resources:																									

Duty: Certification: Front End and Steering Systems		Duty No. K																			
		Task No. 3																			
Task: Lubricate steering linkage using appropriate equipment to maintain lubrication.																					
<table border="0"> <tr> <td>Achievement Indicators: The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Checked manufacturer's service manual for proper chassis lubrication and lubrication points -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised vehicle properly from floor and supported vehicle following proper safety practices -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Located and cleaned each lubrication zerk fitting on the steering linkage components -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Lubricated components with correct chassis lube -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Checked manufacturer's service manual for proper chassis lubrication and lubrication points -	_____	_____	2. Raised vehicle properly from floor and supported vehicle following proper safety practices -	_____	_____	3. Located and cleaned each lubrication zerk fitting on the steering linkage components -	_____	_____	4. Lubricated components with correct chassis lube -	_____	_____	5. Lowered vehicle to floor -	_____	_____
Achievement Indicators: The learner:	Yes	No																			
1. Checked manufacturer's service manual for proper chassis lubrication and lubrication points -	_____	_____																			
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3. Located and cleaned each lubrication zerk fitting on the steering linkage components -	_____	_____																			
4. Lubricated components with correct chassis lube -	_____	_____																			
5. Lowered vehicle to floor -	_____	_____																			
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the steering linkage is lubricated according to manufacturer's specifications.																					
Tools and Equipment: Lubrication Equipment Basic Tool Set	Resources:																				

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K Task No. 4	
Task: Check manual steering gear fluid level using appropriate equipment to detect all fluid levels less than operating levels.			
Achievement Indicators: The learner:		Yes	No
1. Checked manufacturer's service manual to determine proper lubrication levels and requirements -		_____	_____
2. Cleaned area around manual steering gear filler plug -		_____	_____
3. Removed filler plug -		_____	_____
4. Checked fluid level -		_____	_____
5. Added proper lubrication to restore level if necessary -		_____	_____
6. Reinstalled filler plug --		_____	_____
Criteria: Competence in this task will be recongized when the achievement indicators are performed according to the supervisor's directions and all fluid levels less than operating levels according to manufacturer's specifications are detected.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 5
Task: Check power steering fluid level using appropriate equipment to detect all fluid levels less than operating levels.		
Achievement Indicators: The learner:		
	Yes	No
1. Checked manufacturer's service manual for proper power steering lubrication levels and requirements -	_____	_____
2. Cleaned around reservoir cover or fill cap and removed -	_____	_____
3. Checked fluid level -	_____	_____
4. Added recommended fluid to proper level (NOTE: Fluid level differs depending upon whether cold or at operating temperature) -	_____	_____
5. Replaced fill cap or cover -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and all fluid levels less than operating levels according to manufacturer's specifications are detected.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																		
		Task No. 6																		
Task: Check tire pressure using appropriate equipment and pressure gauge to detect tire pressures deviating from manufacturer's specifications.																				
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Removed protective cap from tire valve -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked tire pressure (NOTE: Check when cold) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Added air to tire if pressure is below specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed air from tire if pressure is greater than specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced protective cap on tire valve -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Removed protective cap from tire valve -	_____	_____	2. Checked tire pressure (NOTE: Check when cold) -	_____	_____	3. Added air to tire if pressure is below specifications -	_____	_____	4. Removed air from tire if pressure is greater than specifications -	_____	_____	5. Replaced protective cap on tire valve -	_____	_____
Achievement Indicators: The learner:	Yes	No																		
1. Removed protective cap from tire valve -	_____	_____																		
2. Checked tire pressure (NOTE: Check when cold) -	_____	_____																		
3. Added air to tire if pressure is below specifications -	_____	_____																		
4. Removed air from tire if pressure is greater than specifications -	_____	_____																		
5. Replaced protective cap on tire valve -	_____	_____																		
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the air pressure is adjusted to manufacturer's specifications.																				
Tools and Equipment: Tire Pressure Gauge	Resources:																			

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																											
		Task No. 7																											
Task: Rotate tires using appropriate equipment to restore even tire wear.																													
<table border="0"> <tr> <td>Achievement Indicators: The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Identified type of tire on vehicle (radial, bias or belted bias) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked manufacturer's recommendations for type of tire and rotation sequence -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Raised vehicle so all tires are off floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed tires from car and inspected for abnormal wear -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Rotated tires according to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Reinstalled tires on car -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked tightness of tire lugs with torque wrench -</td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Identified type of tire on vehicle (radial, bias or belted bias) -	_____	_____	2. Checked manufacturer's recommendations for type of tire and rotation sequence -	_____	_____	3. Raised vehicle so all tires are off floor -	_____	_____	4. Removed tires from car and inspected for abnormal wear -	_____	_____	5. Rotated tires according to manufacturer's specifications -	_____	_____	6. Reinstalled tires on car -	_____	_____	7. Lowered vehicle to floor -	_____	_____	8. Checked tightness of tire lugs with torque wrench -	_____	_____
Achievement Indicators: The learner:	Yes	No																											
1. Identified type of tire on vehicle (radial, bias or belted bias) -	_____	_____																											
2. Checked manufacturer's recommendations for type of tire and rotation sequence -	_____	_____																											
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4. Removed tires from car and inspected for abnormal wear -	_____	_____																											
5. Rotated tires according to manufacturer's specifications -	_____	_____																											
6. Reinstalled tires on car -	_____	_____																											
7. Lowered vehicle to floor -	_____	_____																											
8. Checked tightness of tire lugs with torque wrench -	_____	_____																											
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the tires are rotated according to manufacturer's specifications.																													
Tools and Equipment: Basic Tool Set	Resources:																												

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 8
Task: Balance wheels and tires (on-the-car dynamic) using appropriate equipment to restore minimum vibrations at road speed.		
Achievement Indicators: The learner:		
	Yes	No
1. Raised and supported vehicle properly to balance wheels on car -	_____	_____
2. Prepared wheels and tires (air pressure, tire damage, remove stones, mud and old wheel weights) -	_____	_____
3. Inspected condition, lateral and radial runout -	_____	_____
4. Balanced wheels following equipment operating manual procedures -	_____	_____
5. Checked wheel weights for secure installation -	_____	_____
6. Lowered vehicle to floor -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the tires are balanced to restore minimum vibrations at road speed according to the manufacturer's specifications.		
Tools and Equipment: On-the-car Wheel Balancer Air Pressure Gauge Assorted Wheel Weights Wheel Weight Tool	Resources:	

Duty: Certification: Front End and Steering Systems
(Steering Systems)

Duty No. K

Task No. 9

Task: Balance wheels and tires (off-the-car dynamic) using appropriate equipment to restore minimum vibrations at road speed.

Achievement Indicators: The learner:

Yes

No

1. Prepared wheel and tire (check air pressure, inspected for tire damage, removed stones, mud, old wheel weights) -
2. Inspected condition and lateral and radial runout -
3. Mounted wheel and tire according to equipment operating manual -
4. Balanced wheels following equipment operating manual procedures -
5. Checked wheel weights for secure installation -

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the tires are balanced to restore minimum vibrations at road speed according to manufacturer's specifications.

Tools and Equipment:

Air Pressure Gauge
Assorted Wheel Weights
Wheel Weight Tool
Dynamic Wheel Balancer

Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																
		Task No. 10																
Task: Balance wheels and tires (off car static) using appropriate equipment to restore minimum vibrations at road speed.																		
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Prepared wheel and tire (checked air pressure, inspected for tire damage, removed stones, mud, old wheel weights) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Inspected condition and lateral and radial runout -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Balanced wheels following equipment operating manual procedures -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked wheel weights for secure installation -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Prepared wheel and tire (checked air pressure, inspected for tire damage, removed stones, mud, old wheel weights) -	_____	_____	2. Inspected condition and lateral and radial runout -	_____	_____	3. Balanced wheels following equipment operating manual procedures -	_____	_____	4. Checked wheel weights for secure installation -	_____	_____
Achievement Indicators: The learner:	Yes	No																
1. Prepared wheel and tire (checked air pressure, inspected for tire damage, removed stones, mud, old wheel weights) -	_____	_____																
2. Inspected condition and lateral and radial runout -	_____	_____																
3. Balanced wheels following equipment operating manual procedures -	_____	_____																
4. Checked wheel weights for secure installation -	_____	_____																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the tires are balanced to restore minimum vibrations at road speed according to manufacturer's specifications.																		
Tools and Equipment: Air Pressure Gauge Assorted Wheel Weights Wheel Weight Tool Static Wheel Balancer		Resources:																

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																											
		Task No. 11																											
Task: Replace steering linkage components using appropriate equipment to restore steering and so all hardware will be torqued.																													
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Raised vehicle and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed worn linkage component following manufacturer's recommendations -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Cleaned adjoining surfaces to remove old grease and dirt -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed new linkage component following manufacturer's recommendations -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Tightened all fasteners to proper torque specification -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Lubricated linkage component -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Adjusted toe-in -</td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Raised vehicle and supported vehicle -	_____	_____	2. Removed worn linkage component following manufacturer's recommendations -	_____	_____	3. Cleaned adjoining surfaces to remove old grease and dirt -	_____	_____	4. Installed new linkage component following manufacturer's recommendations -	_____	_____	5. Tightened all fasteners to proper torque specification -	_____	_____	6. Lubricated linkage component -	_____	_____	7. Lowered vehicle to floor -	_____	_____	8. Adjusted toe-in -	_____	_____
Achievement Indicators: The learner:	Yes	No																											
1. Raised vehicle and supported vehicle -	_____	_____																											
2. Removed worn linkage component following manufacturer's recommendations -	_____	_____																											
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6. Lubricated linkage component -	_____	_____																											
7. Lowered vehicle to floor -	_____	_____																											
8. Adjusted toe-in -	_____	_____																											
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the steering linkage components are replaced to restore steering according to manufacturer's specifications.																													
Tools and Equipment: Advanced Tool Set	Resources: ?																												

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 12
Task: Replace manual steering sector using appropriate equipment to restore steering so that steering effort will be even from lock to lock and all hardware is torqued.		
Achievement Indicators: The learner:		Yes No
1. Removed steering gear from car -		_____
2. Inspected steering coupling -		_____
3. Disassembled steering gear -		_____
4. Cleaned and inspected all parts -		_____
5. Serviced and disassembled certain subassemblies if needed -		_____
6. Reassembled parts; installed new ones where needed -		_____
7. Adjusted worm gear bearing preload -		_____
8. Adjusted over center preload and lash adjustment -		_____
9. Lubricated steering gear -		_____
10. Installed steering gear in car -		_____
11. Checked for proper operation -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's direction and the manual steering sector is replaced according to manufacturer's specification.		
Tools and Equipment: Inch Pound Torque Wrench Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems
(Steering Systems)

Duty No. K

Task No. 13

Task: Adjust steering sector using appropriate equipment to restore steering sector "play".

Achievement Indicators: The learner:

Yes No

1. Referred to manufacturer's procedure and specifications - ☐ ☐
2. Raised vehicle and supported vehicle - ☐ ☐
3. Disconnected relay rod from Pitman arm - ☐ ☐
4. Loosened lock nut on sector shaft lash adjustment screw - ☐ ☐
5. Turned sector shaft lash adjustment screw two turns counterclockwise - ☐ ☐
6. Removed horn button or steering wheel spoke trim - ☐ ☐
7. Checked bearing preload according to manufacturer's recommendations, adjusted if necessary - ☐ ☐
8. Centered steering wheel - ☐ ☐
9. Turned sector shaft lash adjusting screw clockwise until resistance was felt - ☐ ☐
10. Turned steering wheel one half turn to the left - ☐ ☐
11. Using an inch-pound torque wrench, turned steering wheel one full turn to the right, observing the highest torque reading as wheel passed through center position. (NOTE: This reading shows the over-center preload.) - ☐ ☐
12. Compared torque reading with manufacturers specifications - ☐ ☐
13. Readjusted and rechecked preload until specified over-center preload is obtained - ☐ ☐
14. Tightened lock nut - ☐ ☐
15. Rechecked over-center preload - ☐ ☐
16. Installed horn button or steering wheel spoke trim - ☐ ☐
17. Connected relay rod to Pitman arm - ☐ ☐

The learner: (cont.)

Yes

No

18. Lowered car to floor -

Criteria: Competence in this task will be recongized when the achievement indicators are performed according to the supervirsor's directions and the steering sector "play" is restored according to manufacturer's specifications.

Tools and Equipment:

Basic Tool Set
Inch Pound Torque
Wrench

Resources:

Duty: Certification: Front End and Steering Systems
(Steering Systems)

Duty No. K

Task No. 14

Task: Align front end using appropriate equipment to restore front end alignment.

Achievement Indicators: The learner:

Yes No

- | | | |
|--|-------|-------|
| 1. Performed pre-alignment inspection - | _____ | _____ |
| 2. Performed any needed adjustments and repairs - | _____ | _____ |
| 3. Checked and recorded manufacturer's specifications - | _____ | _____ |
| 4. Positioned car and set up equipment - | _____ | _____ |
| 5. Measured and recorded castor camber and S.A.I.
angles of both front wheels - | _____ | _____ |
| 6. Compared measurements with specifications - | _____ | _____ |
| 7. Adjusted camber and castor - | _____ | _____ |
| 8. Measured toe - | _____ | _____ |
| 9. Compared toe measurement with specification - | _____ | _____ |
| 10. Adjusted toe while maintaining or correcting
position of steering wheel - | _____ | _____ |
| 11. Checked toe-out on turns - | _____ | _____ |
| 12. Compared measurement with specifications - | _____ | _____ |
| 13. Torqued all fasteners - | _____ | _____ |
| 14. Road tested car - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the front end is aligned according to manufacturer's specifications and the vehicle steered without pulling or wandering at road speeds.	
Tools and Equipment: Wheel Alignment Equipment Advanced Tool Set	Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)	Duty No. K
	Task No. 15

Task: Adjust toe using appropriate equipment to restore toe-in or toe-out within manufacturer's specifications.

Achievement Indicators: The learner:	Yes	No
1. Performed a pre-alignment inspection -	_____	_____
2. Made any needed adjustments or repairs -	_____	_____
3. Positioned car and set up equipment according to instructions of equipment manufacturer -	_____	_____
4. Located and recorded tow specifications -	_____	_____
5. Centered and locked steering wheel in straight-ahead position -	_____	_____
6. Measured and recorded toe -	_____	_____
7. Determined type and amount of correction required -	_____	_____
8. Loosened clamps located on adjusting sleeves -	_____	_____
9. Turned adjusting sleeves to obtain correct toe -	_____	_____
10. Checked alignment of ball studs in tie-rods and ends by twisting back and forth through an arc of at least 20° -	_____	_____
11. Tightened clamps to specified torque positioned correctly -	_____	_____
12. Checked position of steering wheel -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and toe-in and toe-out are adjusted to within manufacturer's specifications.	
Tools and Equipment: Alignment Equipment Advanced Tool Set	Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																																							
		Task No. 16																																							
Task: Align rear wheels using appropriate equipment to restore rear wheel alignment.																																									
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr><td>1. Performed a pre-alignment inspection -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>2. Performed any needed adjustments or repairs -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>3. Checked and recorded manufacturer's specifications -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>4. Positioned car and set up equipment -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>5. Measured and recorded camber angles of both rear wheels -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>6. Compared measurements with specification -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>7. Adjusted camber to specification -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>8. Measured toe-in -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>9. Compared measurements with specification -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>10. Adjusted toe-in to specification -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>11. Torqued all fasteners -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>12. Road tested car -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Performed a pre-alignment inspection -	_____	_____	2. Performed any needed adjustments or repairs -	_____	_____	3. Checked and recorded manufacturer's specifications -	_____	_____	4. Positioned car and set up equipment -	_____	_____	5. Measured and recorded camber angles of both rear wheels -	_____	_____	6. Compared measurements with specification -	_____	_____	7. Adjusted camber to specification -	_____	_____	8. Measured toe-in -	_____	_____	9. Compared measurements with specification -	_____	_____	10. Adjusted toe-in to specification -	_____	_____	11. Torqued all fasteners -	_____	_____	12. Road tested car -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the rear wheels are aligned according to manufacturer's specifications.																																									
Tools and Equipment: Wheel Alignment Equipment Advanced Tool Set	Resources:																																								

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K Task No. 17	
Task: Replace steering damper using appropriate equipment to restore steering damper operation.			
Achievement Indicators: The learner: 1. Raised vehicle and supported vehicle - 2. Disconnected steering damper - 3. Reinstalled new steering damper - 4. Torqued all fasteners to manufacturer's specifications - 5. Lowered vehicle to floor -		Yes 	No
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the steering damper is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Torque Wrench		Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 18
Task: Replace power steering hoses using appropriate equipment to restore steering hose operations.		
Achievement Indicators: The learner:		
	Yes	No
1. Positioned drain pan on floor under lowest end of hose or line to be replaced -	_____	_____
2. Disconnected lowest end of hose -	_____	_____
3. Disconnected upper end of hose -	_____	_____
4. Removed hose from any clamp or bracket that positioned it -	_____	_____
5. Positioned replacement hose in clamp or bracket -	_____	_____
6. Connected ends of hose and aligned to assume position and routing of original hose -	_____	_____
7. Tightened fittings and clamps -	_____	_____
8. Filled reservoir with new fluid of the correct type -	_____	_____
9. Started engine -	_____	_____
10. Bled system by turning steering wheel back and forth without hitting stops -	_____	_____
11. Checked for leaks and level of fluid in reservoir and adjusted if necessary -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the power steering hoses are replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																																
		Task No. 19																																
Task: Replace belts using appropriate equipment to restore belt operation.																																		
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6.	Removed gauge -	_____	_____																															
7.	Ran engine and rechecked tension -	_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the belt tension is replaced and adjusted according to manufacturer's specifications.																																		
Tools and Equipment: Basic Tool Set		Resources:																																

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 20
Task: Replace power steering cylinder using appropriate equipment to restore power steering cylinder operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Raised vehicle and supported it by frame -	_____	_____
2. Positioned drain pan on floor under steering cylinder -	_____	_____
3. Disconnected power steering hoses from cylinder -	_____	_____
4. Disconnected power steering cylinder from linkage -	_____	_____
5. Reinstalled new power steering cylinder -	_____	_____
6. Torqued all fasteners to specifications -	_____	_____
7. Reconnected power steering hoses -	_____	_____
8. Filled reservoir with new fluid of correct type -	_____	_____
9. Started engine -	_____	_____
10. Bled system by turning steering wheel back and forth without hitting stops -	_____	_____
11. Checked for leaks and fluid level in reservoir; adjusted if necessary -	_____	_____
12. Adjusted toe if necessary -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the power steering cylinder is replaced according to manufacturer's specifications so that there are no leaks and all fasteners are torqued.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)	Duty No. K
	Task No. 21

Task: Rebuild power steering cylinder using appropriate equipment to restore power steering cylinder operation.

Achievement Indicators: The learner:	Yes	No
1. Removed power steering cylinder -	_____	_____
2. Referred to manufacturer's power steering cylinder rebuilding procedures; checked disassembly procedures, tolerances, parts replacement, reassembly, and adjustment procedures -	_____	_____
3. Drained power steering cylinder of fluid -	_____	_____
4. Disassembled power steering cylinder following proper procedures -	_____	_____
5. Checked for defective parts and wear tolerances -	_____	_____
6. Replaced all worn or defective parts -	_____	_____
7. Reassembled cylinder following proper procedures -	_____	_____
8. Reinstalled power steering cylinder -	_____	_____
9. Torqued all fasteners to specifications -	_____	_____
10. Reconnected power steering hoses -	_____	_____
11. Filled reservoir with new fluid of correct type -	_____	_____
12. Started engine -	_____	_____
13. Bled system by turning steering wheel back and forth without hitting stops -	_____	_____
14. Checked for leaks and fluid level; adjusted if necessary -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a power steering cylinder is rebuilt according to manufacturer's specifications with no leaks and all hardware is torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)	Duty No. K																																										
Task No. 22																																											
Task: Replace power steering control valve assembly using appropriate equipment to restore power steering control valve operation.																																											
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 15%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Removed power steering assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Referred to manufacturer's power steering control valve assembly replacement procedures -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Drained power steering assembly of fluid -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Disassembled power steering assembly following proper procedures -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed defective power steering valve assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Reinstalled new power steering control valve assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Reassembled power steering assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Made necessary adjustments -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Reinstalled power steering assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Torqued all fasteners to specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Filled reservoir, started engine and bled systems -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Checked for leaks and fluid level; adjusted if necessary -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Checked for proper steering effort and operation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Removed power steering assembly -	_____	_____	2. Referred to manufacturer's power steering control valve assembly replacement procedures -	_____	_____	3. Drained power steering assembly of fluid -	_____	_____	4. Disassembled power steering assembly following proper procedures -	_____	_____	5. Removed defective power steering valve assembly -	_____	_____	6. Reinstalled new power steering control valve assembly -	_____	_____	7. Reassembled power steering assembly -	_____	_____	8. Made necessary adjustments -	_____	_____	9. Reinstalled power steering assembly -	_____	_____	10. Torqued all fasteners to specifications -	_____	_____	11. Filled reservoir, started engine and bled systems -	_____	_____	12. Checked for leaks and fluid level; adjusted if necessary -	_____	_____	13. Checked for proper steering effort and operation -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a power steering power control valve is replaced according to manufacturer's specifications with no leaks and all hardware is torqued.			
Tools and Equipment: Advanced Tool Kit	Resources:		

Duty: Certification: Front End and Steering Systems (Steering Systems)	Duty No. K	
	Task No. 23	
Task: Rebuild power steering control valve assembly using appropriate equipment to restore power steering control valve operation.		
Achievement Indicators: The learner:	Yes	No
1. Removed power steering assembly -	_____	_____
2. Referred to manufacturer's power steering control valve assembly rebuilding procedures -	_____	_____
3. Drained power steering assembly of fluid -	_____	_____
4. Disassembled power steering assembly following proper procedures -	_____	_____
5. Removed defective power steering control valve assembly -	_____	_____
6. Disassembled control valve assembly following proper procedures -	_____	_____
7. Checked for defective parts and wear tolerances -	_____	_____
8. Replaced all worn or defective parts -	_____	_____
9. Reassembled control valve -	_____	_____
10. Reassembled power steering assembly -	_____	_____
11. Made necessary adjustments -	_____	_____
12. Reinstalled power steering assembly -	_____	_____
13. Torqued all fasteners to specifications -	_____	_____
14. Filled reservoir, started engine and bled system -	_____	_____
15. Checked for leaks and fluid level; adjusted if necessary -	_____	_____
16. Checked for proper steering effort and operation -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a power steering control valve is rebuilt according to manufacturer's specifications with no leaks and with all hardware torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems		Duty No. K																																																													
		Task No. 24																																																													
Task: Replaced power steering pump using appropriate equipment to restore power steering pump operation.																																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Positioned drain pan to catch fluid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed belt -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed pump -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Transferred any brackets to replacement pump if necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed replacement pump -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Adjusted belt tension -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Torqued all mounting bolts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Connected hoses -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Filled reservoir with correct fluid -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Bled system and adjusted reservoir -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Checked for fluid leaks; corrected if necessary -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Tested pump pressure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>14. Test drove vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Positioned drain pan to catch fluid -		_____	_____	2. Disconnected hoses -		_____	_____	3. Removed belt -		_____	_____	4. Removed pump -		_____	_____	5. Transferred any brackets to replacement pump if necessary -		_____	_____	6. Installed replacement pump -		_____	_____	7. Adjusted belt tension -		_____	_____	8. Torqued all mounting bolts -		_____	_____	9. Connected hoses -		_____	_____	10. Filled reservoir with correct fluid -		_____	_____	11. Bled system and adjusted reservoir -		_____	_____	12. Checked for fluid leaks; corrected if necessary -		_____	_____	13. Tested pump pressure -		_____	_____	14. Test drove vehicle -		_____	_____
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14. Test drove vehicle -		_____	_____																																																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a power steering pump is replaced according to manufacturer's specifications.																																																															
Tools and Equipment: Basic Tool Set		Resources:																																																													

Duty: Certification: Front End and Steering Systems (Steering Systems)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">K</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">25</td> </tr> </table>	Duty No.	K	Task No.	25																																																					
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Task: Rebuild power steering pump using appropriate equipment to restore power steering pump operation.																																																										
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the pump is rebuilt according to manufacturer's specifications without any leaks and all hardware torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems
(Steering Systems)

Duty No. K

Task No. 26

Task: Rebuild rack and pinion power steering assembly using appropriate equipment to restore rack and pinion power steering operation.

Achievement Indicators: The learner:

Yes No

- | | | |
|---|-------|-------|
| 1. Disconnected battery ground cable - | _____ | _____ |
| 2. Removed coupling clamp bolt - | _____ | _____ |
| 3. Raised and supported vehicle - | _____ | _____ |
| 4. Disconnected tie-rod ends - | _____ | _____ |
| 5. Removed steering gear assembly and hose connections - | _____ | _____ |
| 6. Disassembled steering gear - | _____ | _____ |
| 7. Cleaned and inspected all parts according to manufacturer's specifications - | _____ | _____ |
| 8. Replaced all worn or defective parts - | _____ | _____ |
| 9. Reassembled steering gear assembly - | _____ | _____ |
| 10. Adjusted pinion bearing preload - | _____ | _____ |
| 11. Adjusted support yoke - | _____ | _____ |
| 12. Installed steering gear on vehicle - | _____ | _____ |
| 13. Installed power steering hoses - | _____ | _____ |
| 14. Connected tie-rod ends - | _____ | _____ |
| 15. Lowered vehicle to floor - | _____ | _____ |
| 16. Installed coupling clamp bolt - | _____ | _____ |
| 17. Connected battery ground clamp - | _____ | _____ |
| 18. Filled and bled power steering system - | _____ | _____ |
| 19. Checked for leaks and proper steering gear operation - | _____ | _____ |
| 20. Adjusted toe-in - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a rack and pinion power steering assembly is rebuilt according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set	Resources:		

Duty: Certification: Front End and Steering Systems
(Steering Systems)

Duty No. K

Task No. 27

Task: Rebuild rack and pinion manual steering assembly using appropriate equipment to restore rack and pinion manual steering operation.

Achievement Indicators:	The learner:	Yes	No
1.	Disconnected battery ground cable -	_____	_____
2.	Removed coupling clamp bolt -	_____	_____
3.	Raised and supported car -	_____	_____
4.	Disconnected tie-rod ends -	_____	_____
5.	Removed steering gear assembly -	_____	_____
6.	Disassembled steering gear -	_____	_____
7.	Cleaned and inspected all parts according to manufacturer's specifications -	_____	_____
8.	Replaced all worn or defective parts -	_____	_____
9.	Reassembled and lubricated steering gear -	_____	_____
10.	Adjusted pinion bearing preload -	_____	_____
11.	Adjusted support yoke -	_____	_____
12.	Checked operation of steering gear -	_____	_____
13.	Installed steering gear on car -	_____	_____
14.	Connected tie-rod ends -	_____	_____
15.	Lowered car to floor -	_____	_____
16.	Installed coupling clamp bolt -	_____	_____
17.	Connected battery ground cable -	_____	_____
18.	Adjusted toe-in -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a rack and pinion manual steering assembly is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K
		Task No. 28
Task: Replace steering wheel using appropriate equipment to restore steering wheel operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Disconnected battery ground cable from battery post -	_____	_____
2. Removed horn button or steering wheel spoke trim -	_____	_____
3. Removed steering wheel nut -	_____	_____
4. Checked shaft and hub for reference marks to insure proper reassembly (NOTE: If no reference mark was found, scribed or punched reference marks) -	_____	_____
5. Installed steering wheel pulley -	_____	_____
6. Removed steering wheel -	_____	_____
7. Checked to be sure turn signal switch was in center position -	_____	_____
8. Placed steering wheel on steering shaft, guiding it over splines with reference marks aligned -	_____	_____
9. Installed steering wheel nut and tightened to specification -	_____	_____
10. Installed horn button, being sure to reconnect horn wire -	_____	_____
11. Connected battery ground cable to battery post -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a steering wheel is centered and retaining nut is torqued.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Steering Systems)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">K</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">29</td> </tr> </table>	Duty No.	K	Task No.	29																																																		
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Task: Replace ignition switch rack using appropriate equipment to restore ignition switch operation.																																																							
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Checked shaft and hub for reference marks to insure proper reassembly (NOTE: If no reference mark was found, scribed or punched reference marks) -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">5. Installed steering wheel pulley -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">6. Removed steering wheel -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">7. Removed lock plate and/or cancelling cam -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">8. Removed turn signal switch -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">9. Removed ignition lock and rack -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">10. Installed new ignition switch rack (NOTE: Assembled rack so first rack tooth engaged between first and second tooth of sector) -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">11. Reassembled ignition lock, turn signal switch, lock plate and/or cancelling cam -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">12. Checked to be sure turn signal switch was in center position -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">13. Placed steering wheel on steering shaft guiding it over splines with reference marks aligned -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">14. Installed steering wheel nut -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">15. Tightened steering wheel nut to specifications -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">16. Installed horn button being sure to reconnect horn wire -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">17. Connected battery ground cable to battery post -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Disconnected battery ground cable from battery post -	_____	_____	2. Removed horn button or steering wheel spoke trim -	_____	_____	3. Removed steering wheel nut -	_____	_____	4. Checked shaft and hub for reference marks to insure proper reassembly (NOTE: If no reference mark was found, scribed or punched reference marks) -	_____	_____	5. Installed steering wheel pulley -	_____	_____	6. Removed steering wheel -	_____	_____	7. Removed lock plate and/or cancelling cam -	_____	_____	8. Removed turn signal switch -	_____	_____	9. Removed ignition lock and rack -	_____	_____	10. Installed new ignition switch rack (NOTE: Assembled rack so first rack tooth engaged between first and second tooth of sector) -	_____	_____	11. Reassembled ignition lock, turn signal switch, lock plate and/or cancelling cam -	_____	_____	12. Checked to be sure turn signal switch was in center position -	_____	_____	13. Placed steering wheel on steering shaft guiding it over splines with reference marks aligned -	_____	_____	14. Installed steering wheel nut -	_____	_____	15. Tightened steering wheel nut to specifications -	_____	_____	16. Installed horn button being sure to reconnect horn wire -	_____	_____	17. Connected battery ground cable to battery post -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and an ignition switch rack is replaced according to manufacturer's specifications.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Front End and Steering Systems (Steering Systems)		Duty No. K																																	
		Task No. 30																																	
Task: Replace steering mast jacket using appropriate equipment to restore steering mast jacket functions.																																			
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to individual manufacturer's steering assembly mast jacket procedures -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Remove steering wheel; disconnected mast jacket, brackets, clamps, necessary wiring and removed column assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. With assembly mounted in vise, disassembled unit; removed lower steering shaft bearing and removed shaft assembly up through column tube -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Installed new mast jacket in reverse order -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed steering column assembly in vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Aligned steering shaft in flexible coupling, reconnected wires and reinstalled steering wheel -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked for proper operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to individual manufacturer's steering assembly mast jacket procedures -		_____	_____	2. Remove steering wheel; disconnected mast jacket, brackets, clamps, necessary wiring and removed column assembly -		_____	_____	3. With assembly mounted in vise, disassembled unit; removed lower steering shaft bearing and removed shaft assembly up through column tube -		_____	_____	4. Installed new mast jacket in reverse order -		_____	_____	5. Installed steering column assembly in vehicle -		_____	_____	6. Aligned steering shaft in flexible coupling, reconnected wires and reinstalled steering wheel -		_____	_____	7. Checked for proper operation -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a steering mast jacket is replaced according to manufacturer's specifications so that steering effort is even with no binding.																																			
Tools and Equipment: Basic Tool Set	Resources:																																		

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 1
Task: Inspect tires and wheels using appropriate equipment to detect damage and unusual wear.		
Achievement Indicators: The learner:		
	Yes	No
1. Raised and supported vehicle by frame -	_____	_____
2. Measured radial and lateral runout -	_____	_____
3. Removed tire from vehicle -	_____	_____
4. Dismounted tire using tire changer; following equipment procedure sheet -	_____	_____
5. Inspected tire for abnormal wear, sidewall puncture, cuts or cracks, loosened cords, ply separating, thread separation and damaged bead -	_____	_____
6. Inspected wheel for being bent, dented, excessive runout, leak at welds, enlarged bolt holes and heavily rusted -	_____	_____
7. Inspected tire valve for damage and leakage -	_____	_____
8. Remounted tire on wheel and inflated to recommended pressure -	_____	_____
9. Reinstalled tire assembly to vehicle, torqued all lug nuts -	_____	_____
10. Lowered vehicle to floor -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and damage and unusual wear are detected according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set Dial Indicator	Resources: 	

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 2
Task: Inspect suspension system using appropriate equipment to detect all parts worn beyond manufacturer's specification.		
Achievement Indicators: The learner:		Yes No
1. Removed any items from car that may have affected suspension height -		_____
2. Checked for correct tire size, wear and pressures -		_____
3. Checked suspension height with manufacturer's specifications -		_____
4. Checked shock absorbers for leakage, looseness, damaged bushings and wear -		_____
5. Checked ball joints for radial play, axial play and damaged grease seals -		_____
6. Checked control arms and strut rods for damage, bushing wear and looseness -		_____
7. Checked stabilizer bars, mounting, links and bearings for wear and damage -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and all parts worn beyond manufacturer's specifications are detected.		
Tools and Equipment: Dial Indicator Measuring Tape Large Pry Bar	Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L	
		Task No. 3	
Task: Replace suspension bushings using appropriate equipment to restore suspension bushing operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's suspension bushing replacement procedure -		_____	_____
2. Raised and supported vehicle to remove worn component -		_____	_____
3. Removed suspension component with worn bushings following manufacturer's procedure -		_____	_____
4. Replaced worn bushings -		_____	_____
5. Reinstalled suspension component following manufacturer's installation procedure -		_____	_____
6. Lowered vehicle to floor -		_____	_____
7. Torqued all bushings with wheels of vehicle on floor -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and suspension bushings are replaced to restore suspension bushing operation without bushing "windup" according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L																																											
		Task No. 4																																											
Task: Repack wheel bearings using appropriate equipment to restore wheel bearing lubrication.																																													
<table border="1"> <thead> <tr> <th> Achievement Indicators: The learner: </th> <th> Yes </th> <th> No </th> </tr> </thead> <tbody> <tr> <td>1. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed wheel -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed hub assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed retainer and inner bearing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Cleaned and inspected parts for wear -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Repacked bearings -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed inner bearing and seal -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed hub assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed outer bearing, washer and nut -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Adjusted bearings to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Installed cotter pin and grease cap -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Installed wheel and lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Torqued lug nuts and installed wheel cover -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Raised and supported vehicle -	_____	_____	2. Removed wheel -	_____	_____	3. Removed hub assembly -	_____	_____	4. Removed retainer and inner bearing -	_____	_____	5. Cleaned and inspected parts for wear -	_____	_____	6. Repacked bearings -	_____	_____	7. Installed inner bearing and seal -	_____	_____	8. Installed hub assembly -	_____	_____	9. Installed outer bearing, washer and nut -	_____	_____	10. Adjusted bearings to manufacturer's specifications -	_____	_____	11. Installed cotter pin and grease cap -	_____	_____	12. Installed wheel and lowered vehicle to floor -	_____	_____	13. Torqued lug nuts and installed wheel cover -	_____	_____
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13. Torqued lug nuts and installed wheel cover -	_____	_____																																											
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the wheel bearings are repacked according to manufacturer's specifications so that clean grease is visible on inner and outer shell.																																													
Tools and Equipment: Basic Tool Set	Resources:																																												

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 5
Task: Replace front wheel bearings (drum brake) using appropriate equipment to restore wheel bearing operations.		
Achievement Indicators: The learner:		
	Yes	No
1. Raised and supported vehicle -	_____	_____
2. Removed wheel -	_____	_____
3. Removed hub and brake drum assembly -	_____	_____
4. Removed retainer and inner wheel bearing -	_____	_____
5. Removed inner and outer bearing race -	_____	_____
6. Installed new inner and outer bearing race -	_____	_____
7. Repacked new wheel bearings using proper lubricants -	_____	_____
8. Installed inner bearing and seal -	_____	_____
9. Installed hub assembly -	_____	_____
10. Installed outer bearing, washer and nut -	_____	_____
11. Adjusted bearings to manufacturer's specifications -	_____	_____
12. Installed cotter pin and grease cap -	_____	_____
13. Installed wheel and lower vehicle to floor -	_____	_____
14. Torqued lug nuts and installed wheel cover -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and front wheel bearings are replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L																																														
		Task No. 6																																														
Task: Replace front wheel bearings (disc brakes) using appropriate equipment to restore wheel bearing operations.																																																
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed wheel -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed disc brake caliper (NOTE: Did not let caliper hang by hose and supported it) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed disc and hub assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed retainer and inner wheel bearing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Removed inner and outer bearing race -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed new inner and outer bearing race -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Repacked new wheel bearings using proper lubricant -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed inner bearing and seal -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Installed disc and hub assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Installed outer bearing, washer and nut -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Adjusted bearings to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Installed cotter pin and grease cap -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>14. Installed disc brake caliper -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Raised and supported vehicle -	_____	_____	2. Removed wheel -	_____	_____	3. Removed disc brake caliper (NOTE: Did not let caliper hang by hose and supported it) -	_____	_____	4. Removed disc and hub assembly -	_____	_____	5. Removed retainer and inner wheel bearing -	_____	_____	6. Removed inner and outer bearing race -	_____	_____	7. Installed new inner and outer bearing race -	_____	_____	8. Repacked new wheel bearings using proper lubricant -	_____	_____	9. Installed inner bearing and seal -	_____	_____	10. Installed disc and hub assembly -	_____	_____	11. Installed outer bearing, washer and nut -	_____	_____	12. Adjusted bearings to manufacturer's specifications -	_____	_____	13. Installed cotter pin and grease cap -	_____	_____	14. Installed disc brake caliper -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and front wheel bearings are replaced according to manufacturer's specifications.																																																
Tools and Equipment: Basic Tool Set		Resources:																																														

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 7
Task: Replace shock absorbers using appropriate equipment to restore shock absorber operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Raised and supported vehicle -	_____	_____
2. Removed upper mounting nuts and locks -	_____	_____
3. Removed lower mounting nuts and locks -	_____	_____
4. Removed shock -	_____	_____
5. Bled replacement shock absorbers -	_____	_____
6. Positioned replacement shock and installed upper attaching bolts -	_____	_____
7. Connected lower end of shock and installed lower attaching bolts -	_____	_____
8. Torqued all attaching bolts so bushings are compressed -	_____	_____
9. Lowered vehicle to floor and checked for interference with other chassis parts -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the shock absorbers are replaced according to manufacturer's specifications so that all hardware is torqued and bushings are compressed.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">L</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">8</td> </tr> </table>	Duty No.	L	Task No.	8																																																								
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Task: Replace ball joints using appropriate equipment to restore ball joint operation.																																																													
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; width: 60%;">Achievement Indicators:</th> <th style="text-align: left; width: 20%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> <tr> <td style="padding-top: 10px;">1. Referred to manufacturer's procedure to replace ball joint -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">2. Raised and supported vehicle -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">3. Removed wheel and tire assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">4. Removed any parts needed to gain access to ball joint -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">5. Disconnected ball joint from steering knuckle -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">6. Removed ball joint from control arm -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">7. Installed replacement ball joint on control arm -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">8. Connected ball joint stud to steering knuckle -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">9. Installed any parts removed to gain access to ball joint -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">10. Lubricated ball joint -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">11. Installed wheel and tire assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">12. Lowered vehicle to floor -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">13. Torqued wheel lugs -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-top: 5px;">14. Aligned wheels -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>		Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's procedure to replace ball joint -		_____	_____	2. Raised and supported vehicle -		_____	_____	3. Removed wheel and tire assembly -		_____	_____	4. Removed any parts needed to gain access to ball joint -		_____	_____	5. Disconnected ball joint from steering knuckle -		_____	_____	6. Removed ball joint from control arm -		_____	_____	7. Installed replacement ball joint on control arm -		_____	_____	8. Connected ball joint stud to steering knuckle -		_____	_____	9. Installed any parts removed to gain access to ball joint -		_____	_____	10. Lubricated ball joint -		_____	_____	11. Installed wheel and tire assembly -		_____	_____	12. Lowered vehicle to floor -		_____	_____	13. Torqued wheel lugs -		_____	_____	14. Aligned wheels -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a ball joint is replaced according to manufacturer's specifications to restore ball joint operation.

Tools and Equipment:

Advanced Tool Set
Ball Joint Press

Resources:

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L																																				
		Task No. 9																																				
Task: Replace coil spring(s) using appropriate equipment to restore coil spring operation.																																						
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure for replacing coil and springs -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed any parts necessary to gain access to spring -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compressed spring or disconnected lower control arm from frame and slowly lowered control arm -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed spring -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed replacement spring; secured lower control arm to frame -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed any parts removed to gain access to spring -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Torqued all fasteners to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Checked wheel alignment and curb height -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Corrected if necessary -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure for replacing coil and springs -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed any parts necessary to gain access to spring -	_____	_____	4. Compressed spring or disconnected lower control arm from frame and slowly lowered control arm -	_____	_____	5. Removed spring -	_____	_____	6. Installed replacement spring; secured lower control arm to frame -	_____	_____	7. Installed any parts removed to gain access to spring -	_____	_____	8. Lowered vehicle to floor -	_____	_____	9. Torqued all fasteners to manufacturer's specifications -	_____	_____	10. Checked wheel alignment and curb height -	_____	_____	11. Corrected if necessary -	_____	_____
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11. Corrected if necessary -	_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and coil spring(s) is replaced according to manufacturer's specifications with the coil seated, hardware torqued and curb height with specifications.																																						
Tools and Equipment: Advanced Tool Set Coil Spring Compressor	Resources:																																					

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 10
Task: Replace control arms using appropriate equipment to restore control arm operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's procedure to replace upper or lower control arm -	_____	_____
2. Raised and supported vehicle -	_____	_____
3. Removed wheel and tire assembly -	_____	_____
4. Supported or removed coil spring as required -	_____	_____
5. Disconnected any struts or links -	_____	_____
6. Disconnected ball joint from steering knuckle -	_____	_____
7. Disconnected control arm from frame -	_____	_____
8. Connected replacement control arm to frame -	_____	_____
9. Connected struts or links -	_____	_____
10. Installed coil spring if it was removed -	_____	_____
11. Torqued all hardware with weight on wheels -	_____	_____
12. Aligned front end -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the control arms are replaced according to manufacturer's specifications so that all hardware is torqued, bushings centered and compressed equally.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L																																								
		Task No. 11																																								
Task: Replace torsion bar(s) using appropriate equipment to restore torsion bar operation.																																										
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for torsion bar replacement procedure -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed load from torsion bar(s) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Aligned and removed attaching parts as required -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed torsion bar(s) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Inspected and lubricated parts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed torsion bar -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed attaching parts as required -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Loaded torsion bar(s) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Adjusted suspension height -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Performed wheel alignment -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for torsion bar replacement procedure -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed load from torsion bar(s) -	_____	_____	4. Aligned and removed attaching parts as required -	_____	_____	5. Removed torsion bar(s) -	_____	_____	6. Inspected and lubricated parts -	_____	_____	7. Installed torsion bar -	_____	_____	8. Installed attaching parts as required -	_____	_____	9. Loaded torsion bar(s) -	_____	_____	10. Lowered vehicle to floor -	_____	_____	11. Adjusted suspension height -	_____	_____	12. Performed wheel alignment -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and torsion bar(s) is replaced according to manufacturer's specifications to restore ride height to specifications.																																										
Tools and Equipment: Advanced Tool Set	Resources:																																									

Duty: Certification: Front End and Steering Systems (Suspension Systems)	Duty No. L
	Task No. 13

Task: Replace king pins using appropriate equipment to restore king pin operation.

Achievement Indicators: The learner:

Yes No

1. Referred to manufacturer's repair manual for specifications and procedure to replace king pins -
2. Raised and supported vehicle -
3. Removed front wheel assemblies -
4. Removed brake backing plates from steering knuckles -
5. Removed king pin locking bolt, or pins and upper and lower dust seals/grease cup, snap rings, etc. -
6. Drove out king pins and separate steering knuckles from axle, etc. -
7. Rebushed steering knuckle and hone to fit new king pins if required -
8. Installed steering knuckles and new king pins on vehicle -
9. Installed locking bolt, pins grease cup, dust seals and snap rings -
10. Installed brake backing plates -
11. Installed front wheel assembly -
12. Lubricated new king pins and bushings; lowered vehicle to floor -

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and king pins are replaced according to manufacturer's specifications without any binding or side play.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems (Suspension Systems)	Duty No. L																																																
Task No. 14																																																	
Task: Replace McPherson Strut assembly using appropriate equipment to restore McPherson Strut assembly operation.																																																	
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 20%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure to replace McPherson Strut assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Raised and supported vehicle by frame -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Removed wheel and tire assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Removed mounting nuts holding top of strut to inner fender well -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed lower mounting bolts or separate ball joint taper -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed brake line and hose if attached -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Pried down on lower control arm or transverse link -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Removed strut assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Reinstalled replacement strut assembly by prying down lower control arm -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Torqued ball joint nut or lower mounting bolts -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Attached brake hose and line -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Torqued upper mounting bolts -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Installed wheel and tire assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Checked wheel alignment -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>15. Corrected if necessary -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to replace McPherson Strut assembly -	_____	_____	2. Raised and supported vehicle by frame -	_____	_____	3. Removed wheel and tire assembly -	_____	_____	4. Removed mounting nuts holding top of strut to inner fender well -	_____	_____	5. Removed lower mounting bolts or separate ball joint taper -	_____	_____	6. Removed brake line and hose if attached -	_____	_____	7. Pried down on lower control arm or transverse link -	_____	_____	8. Removed strut assembly -	_____	_____	9. Reinstalled replacement strut assembly by prying down lower control arm -	_____	_____	10. Torqued ball joint nut or lower mounting bolts -	_____	_____	11. Attached brake hose and line -	_____	_____	12. Torqued upper mounting bolts -	_____	_____	13. Installed wheel and tire assembly -	_____	_____	14. Checked wheel alignment -	_____	_____	15. Corrected if necessary -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the McPherson Strut assembly is replaced according to manufacturer's specifications with all hardware torqued, no binding and curb height to specifications.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Front End and Steering Systems (Suspension Systems)	Duty No. L
	Task No. 15

Task: Rebuild McPherson Strut assembly using appropriate equipment to restore McPherson Strut assembly operation.

Achievement Indicators: The learner:

Yes No

- | | | |
|---|-------|-------|
| 1. Referred to manufacturer's repair manual for procedure to rebuild McPherson Strut assembly - | _____ | _____ |
| 2. Raised and supported vehicle by frame - | _____ | _____ |
| 3. Removed wheel and tire assembly - | _____ | _____ |
| 4. Removed mounting nuts holdings top of strut to inner fender well - | _____ | _____ |
| 5. Removed lower mounting bolts or separated ball joint taper - | _____ | _____ |
| 6. Removed brake line hose if attached - | _____ | _____ |
| 7. Pried down on lower control arm or transverse link - | _____ | _____ |
| 8. Removed strut assembly - | _____ | _____ |
| 9. Compressed coil spring and removed top mounting assembly - | _____ | _____ |
| 10. Removed strut nut with spanner wrench - | _____ | _____ |
| 11. Removed piston and all internal parts - | _____ | _____ |
| 12. Cleaned and checked all parts for wear - | _____ | _____ |
| 13. Replaced worn parts of installed new cartridge - | _____ | _____ |
| 14. Tightened nut over strut or cartridge - | _____ | _____ |
| 15. Installed spring and checked for proper alignment - | _____ | _____ |
| 16. Compressed spring and installed dust shield - | _____ | _____ |
| 17. Installed and tightened piston nut - | _____ | _____ |
| 18. Reinstalled strut assembly - | _____ | _____ |
| 19. Torqued ball joint nut or lower mounting bolts - | _____ | _____ |
| 20. Attached brake line and hose - | _____ | _____ |
| 21. Torqued upper mounting bolts - | _____ | _____ |

The learner:

Yes

No

22. Installed wheel and tire assembly -

23. Checked wheel alignment and corrected if necessary -

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a McPherson Strut is rebuilt according to manufacturer's specifications with all hardware torqued, no binding and curb height to specifications.

Tools and Equipment:

Advanced Tool Set
Spring Compressor
Spanner Wrench

Resources:

Duty: Certification: Front End and Steering Systems (Suspension Systems)		Duty No. L
		Task No. 16
Task: Replace trunion pin assembly using appropriate equipment to restore trunion pin operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace trunion pin assembly -	_____	_____
2. Raised and supported the vehicle -	_____	_____
3. Removed front coil spring -	_____	_____
4. Removed trunion and inspected knuckle pin -	_____	_____
5. Removed trunion bushings and thrust bearings -	_____	_____
6. Installed new bushings and thrust bearings -	_____	_____
7. Installed trunion -	_____	_____
8. Installed coil spring -	_____	_____
9. Lowered vehicle to floor -	_____	_____
10. Checked wheel alignment -	_____	_____
11. Adjusted if necessary -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the trunion pin assembly is replaced according to manufacturer's specifications, with all hardware torqued and wheels aligned.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Front End and Steering Systems (Suspension Systems)	Duty No. L																																														
	Task No. 17																																														
Task: Replace leaf spring assembly using appropriate equipment to restore leaf spring operation.																																															
<table border="0"> <thead> <tr> <th> Achievement Indicators: The learner: </th> <th> Yes </th> <th> No </th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair procedure on replacing a leaf spring assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected shock absorber -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed U-bolts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed shackle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Removed spring bolt -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Removed spring -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Cleaned and inspected all parts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed spring bolt -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Installed shackle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Secured spring to axle housing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Torqued U-bolts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Connected shock absorber -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>14. Lowered car to floor; torqued spring bolt and shackle to specifications -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair procedure on replacing a leaf spring assembly -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Disconnected shock absorber -	_____	_____	4. Removed U-bolts -	_____	_____	5. Removed shackle -	_____	_____	6. Removed spring bolt -	_____	_____	7. Removed spring -	_____	_____	8. Cleaned and inspected all parts -	_____	_____	9. Installed spring bolt -	_____	_____	10. Installed shackle -	_____	_____	11. Secured spring to axle housing -	_____	_____	12. Torqued U-bolts -	_____	_____	13. Connected shock absorber -	_____	_____	14. Lowered car to floor; torqued spring bolt and shackle to specifications -	_____	_____
Achievement Indicators: The learner:	Yes	No																																													
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14. Lowered car to floor; torqued spring bolt and shackle to specifications -	_____	_____																																													

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a leaf spring assembly is replaced according to manufacturer's specifications and all hardware torqued and spring center bolt is seated.	
Tools and Equipment: Advanced Tool Set	Resources:

Duty: Certification: Engine Repair (Diagnose the Engine)		Duty No. M
		Task No. 1
Task: Test cylinder balance using appropriate equipment to detect a cylinder to cylinder deviation exceeding 10%.		
Achievement Indicators: The learner:		Yes No
1. Referred to manufacturer's repair manual for correct procedure to test cylinder balance -		_____
2. Connected tachometer or power balance tester to engine -		_____
3. Started engine -		_____
4. Disconnected EGR valve -		_____
5. Adjusted speed to 1000 RPM, plus or minus 40 RPM -		_____
6. Shorted out cylinders one at a time. (Converter-equipped car shorted 15 sec. max. with 30 sec. between tests) -		_____
7. Recorded RPM drop as a result of shorted cylinder -		_____
8. Compared the readings to each cylinder. (10% deviation max.) -		_____
9. Recorded which cylinders deviate more than 10% from the others -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cylinder balance is tested according to manufacturer's specifications to detect cylinder deviation exceeding 10%.		
Tools and Equipment: Tachometer Insulated Pliers Power Balance Tester Basic Tool Set	Resources:	

Duty: Certification: Engine Repair (Diagnose the Engine)	Duty No. M	
	Task No. 2	
Task: Test cylinder leakage using appropriate equipment to detect leakage in excess of 20%.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test cylinder leakage -	_____	_____
2. Ran engine until normal operating temperature was reached -	_____	_____
3. Removed radiator cap -	_____	_____
4. Removed all spark plugs -	_____	_____
5. Removed air cleaner and set throttle and choke open -	_____	_____
6. Removed crank case filler cap (disconnected one end of P.C.V. system) -	_____	_____
7. Brought test cylinder to TDC on compression stroke -	_____	_____
8. Applied air to test cylinder (Noted % of leakage, 20% max.) -	_____	_____
9. Listened for air leakage (Noted where leakage occurred) -	_____	_____
10. Repeated test for all cylinders -	_____	_____
11. Recorded all readings and compared to specifications -	_____	_____
12. Installed crank case, filler cap and P.C.V. system -	_____	_____
13. Installed air cleaner and closed throttle and choke -	_____	_____
14. Installed spark plugs and wires -	_____	_____
15. Installed radiator cap -	_____	_____
16. Started engine and checked for proper operation -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cylinder leakage is tested according to manufacturer's specifications to detect leakage in excess of 20%.

Tools and Equipment:

Cylinder Leakage Tester
Basic Tool Set

Resources:

Duty: Certification: Engine Repair (Diagnose the Engine)		Duty No. M																												
		Task No. 3																												
Task: Test vacuum leaks using appropriate equipment to detect all vacuum leaks.																														
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to test vacuum leaks - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Connected vacuum gauge to a manifold vacuum source - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Connected tachometer to the engine - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Started engine and brought to normal operating temperature - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Noted the gauge reading and needle action - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Squirted non-combustible cleaning solvent along gasket joints, noses, etc. - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Noted changes in RPM and vacuum readings to detect leaks - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Repaired all leaking gaskets - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test vacuum leaks -	_____	_____	2. Connected vacuum gauge to a manifold vacuum source -	_____	_____	3. Connected tachometer to the engine -	_____	_____	4. Started engine and brought to normal operating temperature -	_____	_____	5. Noted the gauge reading and needle action -	_____	_____	6. Squirted non-combustible cleaning solvent along gasket joints, noses, etc. -	_____	_____	7. Noted changes in RPM and vacuum readings to detect leaks -	_____	_____	8. Repaired all leaking gaskets -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine is tested for vacuum leaks according to the manufacturer's specifications.																														
Tools and Equipment: Vacuum Gauge Tachometer		Resources:																												

Duty: Certification: Engine Repair (Diagnose the Engine		Duty No. M	
		Task No. 4	
Task: Test valve train and guides using appropriate equipment to detect any deviations from manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to test valve train and guides -		☐	☐
2. Connected vacuum gauge to a manifold vacuum source -		☐	☐
3. Started engine and brought to normal operating temperature -		☐	☐
4. Noted gauge readings and needle actions -		☐	☐
5. Compared vacuum readings and needle actions with manufacturer's specifications -		☐	☐
6. Recorded all readings that deviate from manufacturer's specifications -		☐	☐
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and valve train and guide are tested according to manufacturer's specifications.			
Tools and Equipment: Vacuum Gauge		Resources:	

Duty: Certification: Engine Repair (Diagnose the Engine)		Duty No. M																									
		Task No. 5																									
Task: Detect oil leaks using appropriate equipment to detect oil leaks.																											
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to detect oil leaks -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Cleaned engine exterior -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Started engine and brought to normal operating temperature -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Placed large sheet of paper under engine -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Noted oil leakage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Traced oil leakage to its origin -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Repaired all engine oil leaks -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to detect oil leaks -	_____	_____	2. Cleaned engine exterior -	_____	_____	3. Started engine and brought to normal operating temperature -	_____	_____	4. Placed large sheet of paper under engine -	_____	_____	5. Noted oil leakage -	_____	_____	6. Traced oil leakage to its origin -	_____	_____	7. Repaired all engine oil leaks -	_____	_____
Achievement Indicators: The learner:	Yes	No																									
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6. Traced oil leakage to its origin -	_____	_____																									
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and oil leaks are detected according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set	Resources:																										

Duty: Certification: Engine Repair (Diagnose the Engine)		Duty No. M																																	
		Task No. 6																																	
Task: Detect engine noises using appropriate equipment to detect all noises which may lead to engine malfunction.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to detect engine noises -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Started engine and brought to normal operating temperature -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Listened for engine noises with mechanic's stethoscope -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Operated engine at various speeds and at different loads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Listened for noises that occurred at different speeds and loads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Referred to manufacturer's repair manual -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Compared engine noises with manufacturer's specification manual -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to detect engine noises -		_____	_____	2. Started engine and brought to normal operating temperature -		_____	_____	3. Listened for engine noises with mechanic's stethoscope -		_____	_____	4. Operated engine at various speeds and at different loads -		_____	_____	5. Listened for noises that occurred at different speeds and loads -		_____	_____	6. Referred to manufacturer's repair manual -		_____	_____	7. Compared engine noises with manufacturer's specification manual -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine noises are detected according to manufacturer's specifications.																																			
Tools and Equipment: Mechanic's Stethoscope	Resources:																																		

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																												
		Task No. 1																												
Task: Clean engine using appropriate equipment to remove all loose dirt and oil.																														
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Obtained cleaning equipment and cleaning solvent - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Referred to equipment manufacturer's specifications and procedures for steam cleaning the engine - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Protected distributor and carburetor by covering with waterproof material - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Cleaned engine - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Dried as needed (where applicable) - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Protected against rust (where applicable) with the proper anti-rust agent - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Started engine and checked for any malfunctions occurring due to moisture or foreign particles in the operational parts - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure -	_____	_____	2. Obtained cleaning equipment and cleaning solvent -	_____	_____	3. Referred to equipment manufacturer's specifications and procedures for steam cleaning the engine -	_____	_____	4. Protected distributor and carburetor by covering with waterproof material -	_____	_____	5. Cleaned engine -	_____	_____	6. Dried as needed (where applicable) -	_____	_____	7. Protected against rust (where applicable) with the proper anti-rust agent -	_____	_____	8. Started engine and checked for any malfunctions occurring due to moisture or foreign particles in the operational parts -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine is cleaned so no components are damaged from chemicals or heat.																														
Tools and Equipment: Steam Cleaner	Resources:																													

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																															
		Task No. 2																															
Task: Replace core plugs using appropriate equipment to restore core plug operation.																																	
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing core plugs -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Determined which core plug was in need of replacement -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed parts to obtain access to the core plug -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Using the appropriate tool, removed the core plug -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Cleaned in and around the core plug hole -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Using the proper tool, installed the core plug -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Filled the cooling system to the required level with the proper coolant -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Pressure tested the system for leaks -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Ran the engine to normal operating temperature and rechecked coolant level -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing core plugs -	_____	_____	2. Determined which core plug was in need of replacement -	_____	_____	3. Removed parts to obtain access to the core plug -	_____	_____	4. Using the appropriate tool, removed the core plug -	_____	_____	5. Cleaned in and around the core plug hole -	_____	_____	6. Using the proper tool, installed the core plug -	_____	_____	7. Filled the cooling system to the required level with the proper coolant -	_____	_____	8. Pressure tested the system for leaks -	_____	_____	9. Ran the engine to normal operating temperature and rechecked coolant level -	_____	_____
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9. Ran the engine to normal operating temperature and rechecked coolant level -	_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and core plugs are replaced so no leaks occur after the engine reaches operating temperature.																																	
Tools and Equipment: Basic Tool Set	Resources:																																

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																																	
		Task No. 3																																	
Task: Test oil pump pressure using appropriate equipment to detect any deviation from manufacturer's specifications.																																			
<table border="0"> <tr> <td>Achievement Indicators: The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing oil pump pressure -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed oil plug or sending unit from oil gallery -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Installed oil pressure gauge -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Started engine and brought to operating temperature -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Observed oil pressure -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Compared oil pressure to specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Serviced engine or pump if pressure was low -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Removed oil pressure gauge -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed oil plug or sending unit -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Started engine and checked for oil leaks -</td> <td>_____</td> <td>_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing oil pump pressure -	_____	_____	2. Removed oil plug or sending unit from oil gallery -	_____	_____	3. Installed oil pressure gauge -	_____	_____	4. Started engine and brought to operating temperature -	_____	_____	5. Observed oil pressure -	_____	_____	6. Compared oil pressure to specifications -	_____	_____	7. Serviced engine or pump if pressure was low -	_____	_____	8. Removed oil pressure gauge -	_____	_____	9. Installed oil plug or sending unit -	_____	_____	10. Started engine and checked for oil leaks -	_____	_____
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Tools and Equipment: Basic Tool Set Oil Pressure Gauge	Resources:																																		

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																																		
		Task No. 4																																		
Task: Test oil pressure relief valve using appropriate equipment to detect any deviation from manufacturer's specifications.																																				
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to test oil pressure relief valve - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Removed oil plug or sending unit from oil gallery - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Installed pressure gauge - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Started engine and brought to operating temperature - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Observed oil pressure, it should have been consistent - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Compared oil pressure to specifications - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Serviced engine or relief valve if pressure was higher or lower than specifications - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Removed oil pressure gauge - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 9. Installed oil plug or sending unit - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 10. Started engine and checked for oil leaks - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to test oil pressure relief valve -	_____	_____	2. Removed oil plug or sending unit from oil gallery -	_____	_____	3. Installed pressure gauge -	_____	_____	4. Started engine and brought to operating temperature -	_____	_____	5. Observed oil pressure, it should have been consistent -	_____	_____	6. Compared oil pressure to specifications -	_____	_____	7. Serviced engine or relief valve if pressure was higher or lower than specifications -	_____	_____	8. Removed oil pressure gauge -	_____	_____	9. Installed oil plug or sending unit -	_____	_____	10. Started engine and checked for oil leaks -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and oil pressure relief valve is tested according to manufacturer's specifications.																																				
Tools and Equipment: Basic Tool Set Oil Pressure Gauge		Resources:																																		

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																						
		Task No. 5																						
Task: Replace engine mounts using appropriate equipment to restore engine mount operation.																								
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Tools and Equipment: Basic Tool Set	Resources:																							

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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine assembly is replaced according to manufacturer's specifications.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Engine Repair (Cylinder Block)		Duty No. N																																																
		Task No. 7																																																
Task: Replace oil pan using appropriate equipment to restore oil pan operation.																																																		
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Tools and Equipment: Basic Tool Set		Resources:																																																

Duty: Certification: Engine Repair (Cylinder Block)

Duty No. N

Task No. 8

Task: Replace rod bearings using appropriate equipment to restore rod bearing operation.

Achievement Indicators: The learner:

Yes No

- | | | |
|--|-------|-------|
| 1. Referred to manufacturer's repair manual for correct procedure for replacing rod bearings - | _____ | _____ |
| 2. Removed cylinder head(s) - | _____ | _____ |
| 3. Removed oil pan - | _____ | _____ |
| 4. Reamed cylinder ridge - | _____ | _____ |
| 5. Removed rod nuts and caps - | _____ | _____ |
| 6. Removed piston and rod assembly - | _____ | _____ |
| 7. Cleaned and inspected cylinder walls - | _____ | _____ |
| 8. Using inside micrometers or cylinder bore gauge, gauged cylinders for wear and taper - | _____ | _____ |
| 9. Deglazed cylinder - | _____ | _____ |
| 10. Miked crankshaft journals for wear and out-of-round (high and low readings) - | _____ | _____ |
| 11. Removed piston rings - | _____ | _____ |
| 12. Cleaned ring grooves, inspected piston for wear, cracks, lands, and grooves for wear - | _____ | _____ |
| 13. Checked wrist pins for looseness and aligned rod and piston - | _____ | _____ |
| 14. Checked rings for proper ring gap - | _____ | _____ |
| 15. Installed rings being cautious to install in proper grooves and proper side up - | _____ | _____ |
| 16. Lubricated rings generously and installed ring compressor - | _____ | _____ |
| 17. Installed bearings, inserted in rod and cap observing oil holes for alignment - | _____ | _____ |
| 18. Installed connecting rod assembly in engine block - | _____ | _____ |
| 19. Using plastigauge or feeler gauge methods, checked for clearance - | _____ | _____ |
| 20. Retorqued connecting rods - | _____ | _____ |

The learner:		Yes	No
21.	Rotated crank after each connecting rod had been installed -	_____	_____
22.	Crank should have turned freely allowing for slight drag of new rings -	_____	_____
23.	Installed oil pan -	_____	_____
24.	Installed cylinder heads -	_____	_____
25.	Filled crankcase with correct grade and weight oil -	_____	_____
26.	Filled radiator with coolant -	_____	_____
27.	Started engine, checking oil pressure, engine temperature and examined for leaks -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and rod bearings are replaced according to manufacturer's specifications and so all hardware is torqued.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Engine Repair (Cylinder Block)	Duty No. N																																																									
Task No. 9																																																										
Task: Replace pistons using appropriate equipment to restore piston operation.																																																										
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Removed piston and rod assembly, marking each rod and cap as to location -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Cleaned and inspected cylinder walls, then using micrometer or cylinder bore gauge, checked for wear and taper -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Deglazed cylinder walls -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Checked crankshaft journals for wear and out-of-round (high and low readings) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Replaced pistons, checking wrist pins for looseness and aligned pistons and rods -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. 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Reassembled engine components -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>16. Filled crankcase with proper amount and type of oil -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>17. Filled cooling system with coolant -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>18. Started engine, checking for oil leaks, oil pressure and correct operating temperature as per manufacturer's specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace pistons -	_____	_____	2. Removed cylinder head(s) and oil pan -	_____	_____	3. Reamed cylinder ridge -	_____	_____	4. Removed rod nuts and caps -	_____	_____	5. 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Achievement Indicators: The learner:	Yes	No																																																								
1. Referred to manufacturer's repair manual for correct procedure to replace pistons -	_____	_____																																																								
2. Removed cylinder head(s) and oil pan -	_____	_____																																																								
3. Reamed cylinder ridge -	_____	_____																																																								
4. Removed rod nuts and caps -	_____	_____																																																								
5. Removed piston and rod assembly, marking each rod and cap as to location -	_____	_____																																																								
6. Cleaned and inspected cylinder walls, then using micrometer or cylinder bore gauge, checked for wear and taper -	_____	_____																																																								
7. Deglazed cylinder walls -	_____	_____																																																								
8. Checked crankshaft journals for wear and out-of-round (high and low readings) -	_____	_____																																																								
9. Replaced pistons, checking wrist pins for looseness and aligned pistons and rods -	_____	_____																																																								
10. Checked piston rings in cylinder for proper ring gap -	_____	_____																																																								
11. Installed rings on pistons, checking for proper placement or correct grooves -	_____	_____																																																								
12. Lubricated rings generously and using ring compressor, installed pistons into cylinders -	_____	_____																																																								
13. Made sure connecting rods were returned to proper crank journals and pistons were facing in correct direction -	_____	_____																																																								
14. Reinstalled connecting rod caps as per manufacturer's specifications -	_____	_____																																																								
15. Reassembled engine components -	_____	_____																																																								
16. Filled crankcase with proper amount and type of oil -	_____	_____																																																								
17. Filled cooling system with coolant -	_____	_____																																																								
18. Started engine, checking for oil leaks, oil pressure and correct operating temperature as per manufacturer's specifications -	_____	_____																																																								

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and pistons are replaced according to manufacturer's specifications and so all attachment hardware is torqued.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Engine Repair (Cylinder Block)

Duty No. N

Task No. 10

Task: Replace crankshaft using appropriate equipment to restore crankshaft operation.

Achievement Indicators: The learner:

Yes

No

1. Referred to manufacturer's repair manual for correct procedure to replace crankshaft - _____
2. Removed the crankshaft from the engine - _____
3. Inspected the bearing saddles in the block to determine that all lines were clean and blown free of dirt - _____
4. Inspected new bearings and made certain size was correct for the replacement - _____
5. Installed upper bearings in proper place - _____
6. Lubricated top half of bearings with engine oil or other appropriate lubricant - _____
7. Installed the rear main bearing seal - _____
8. Installed crankshaft in place (made certain crankshaft was clean and all oil holes had been blown out) - _____
9. Rotated crankshaft back and forth to make certain no binding occurred - _____
10. Installed bearings in lower caps and lubricated generously - _____
11. Installed bearings in engine block. Measured with plastigauge to meet proper specifications - _____
12. Tightened connecting rod caps to torque specifications in sequential order - _____
13. Turned crankshaft after each bearing had been torqued to insure proper functioning. Did not turn the crankshaft with plastigauge installed - _____
14. Checked connecting rod side clearance and crankshaft end play - _____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and crankshaft is replaced according to manufacturer's specifications and so all attachment hardware is torqued.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Engine Repair (Cylinder Block)

Duty No. N

Task No. 11

Task: Test engine block using appropriate equipment to detect block warpage exceeding manufacturer's specifications.

Achievement Indicators: The learner:

Yes No

1. Referred to manufacturer's manual for correct procedure to test engine block -

2. Cleaned cylinder block -

3. Checked for cracks -

4. Checked for all sealing surfaces with a straight edge -

5. Checked bore alignment with bore alignment bar -

6. Repaired or replaced engine block as required -

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and engine block is tested according to manufacturer's specifications to detect warpage.

Tools and Equipment:

Advanced Tool Set
Straight Edge

Resources:

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0	
		Task No. 1	
Task: Inspect rocker arms using appropriate equipment to detect rocker arm lubrication levels outside manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing rocker arms -		_____	_____
2. Started engine and brought to operating temperature -		_____	_____
3. Stopped engine -		_____	_____
4. Removed valve covers -		_____	_____
5. Started engine -		_____	_____
6. Observed oil flow from rocker arms -		_____	_____
7. Compared with manufacturer's specifications (excessive flow indicated worn components) -		_____	_____
8. Inspected all parts for worn components -		_____	_____
9. Repaired or replaced worn parts -		_____	_____
10. Installed valve covers with new gaskets -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and rocker arms are tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0	
		Task No. 2	
Task: Adjust hydraulic valve lifters using appropriate equipment to restore hydraulic valve lifter clearances.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure -		_____	_____
2. Started engine and brought to normal operating temperature -		_____	_____
3. Removed the valve cover -		_____	_____
4. Checked the proper positioning of the crankshaft and which valves to adjust -		_____	_____
5. Adjusted the valves -		_____	_____
6. Installed rocker arm covers and new gaskets -		_____	_____
7. Checked operation of the engine -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and hydraulic valve lifters are adjusted according to manufacturer's specifications and so rocker arm covers do not leak.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0																		
		Task No. 3																		
Task: Adjust mechanical lifters using appropriate equipment to restore mechanical lifter clearances.																				
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____																			
Criteria: Competence in this task will be recognized when achievement indicators are performed according to the supervisor's directions and mechanical lifters are adjusted according to manufacturer's specifications.																				
Tools and Equipment: Basic Tool Set	Resources:																			

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0																								
		Task No. 4																								
Task: Test valve lifters using appropriate equipment to detect bleed down times outside manufacturer's specifications.																										
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; width: 70%;"> Achievement Indicators: The learner: </th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing valve lifters -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Inspected for wear at the foot of the lifter -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Mounted valve lifter in tester -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Applied specified pressure to lifter -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Measured the bleed down time -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Compared bleed down time to specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Replaced all worn lifters -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing valve lifters -	_____	_____	2. Inspected for wear at the foot of the lifter -	_____	_____	3. Mounted valve lifter in tester -	_____	_____	4. Applied specified pressure to lifter -	_____	_____	5. Measured the bleed down time -	_____	_____	6. Compared bleed down time to specifications -	_____	_____	7. Replaced all worn lifters -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and valve lifters are tested according to manufacturer's specifications.																										
Tools and Equipment: Basic Tool Set Leak Down Tester	Resources:																									

Duty: Certification: Engine Repair (Cylinder Head)	Duty No. 0																																																			
	Task No. 5																																																			
Task: Replace intake manifold using appropriate equipment to restore intake manifold operation.																																																				
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 20%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace intake manifold -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Drained cooling systems -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Disconnected negative battery cable -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Disconnected carburetor linkage, fuel line, vacuum lines and electrical connections -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed components to gain access to manifold -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed intake manifold -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Removed all old gasket material, cleaned surfaces and cleaned exhaust parts -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Checked for surface warpage with feeler gauge and straight edge -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Installed new gaskets -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Installed intake manifold -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Torqued to specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Installed components removed to gain access to manifold -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Connected carburetor linkage, fuel line, vacuum lines, electrical connections -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Connected negative battery cable -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>15. Refilled cooling system -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>16. Started engine and checked for vacuum, fluid or exhaust leaks -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace intake manifold -	_____	_____	2. Drained cooling systems -	_____	_____	3. Disconnected negative battery cable -	_____	_____	4. Disconnected carburetor linkage, fuel line, vacuum lines and electrical connections -	_____	_____	5. Removed components to gain access to manifold -	_____	_____	6. Removed intake manifold -	_____	_____	7. Removed all old gasket material, cleaned surfaces and cleaned exhaust parts -	_____	_____	8. Checked for surface warpage with feeler gauge and straight edge -	_____	_____	9. Installed new gaskets -	_____	_____	10. Installed intake manifold -	_____	_____	11. Torqued to specifications -	_____	_____	12. Installed components removed to gain access to manifold -	_____	_____	13. Connected carburetor linkage, fuel line, vacuum lines, electrical connections -	_____	_____	14. Connected negative battery cable -	_____	_____	15. Refilled cooling system -	_____	_____	16. Started engine and checked for vacuum, fluid or exhaust leaks -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and intake manifold is replaced according to manufacturer's specifications, so that all hardware is torqued and there are no vacuum, fluid or exhaust leaks.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Engine Repair (Cylinder Head)	Duty No. 0																																																															
Task No. 6																																																																
Task: Replace cylinder head using appropriate equipment to restore cylinder head operation.																																																																
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The learner:	Yes	No
21. Connected negative (-) battery cable -	_____	_____
22. Adjusted valves if applicable -	_____	_____
23. Started engine and brought to operating temperatures -	_____	_____
24. Readjusted valves and retorqued cylinder head and manifolds-	_____	_____
25. Installed rocker arm covers -	_____	_____
26. Started engine and inspected for vacuum, fluid and exhaust leaks -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cylinder head is replaced according to manufacturer's specifications so all hardware is torqued and head gasket and exhaust and intake manifolds do not leak.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0																																	
		Task No. 7																																	
Task: Test cylinder head using appropriate equipment to detect cracks and head warpage beyond manufacturer's specifications.																																			
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 80%;">Achievement Indicators: The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing cylinder head -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Disassembled cylinder head -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Cleaned cylinder head -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Inspected head for cracks using:</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Magnaflux -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-left: 20px;">b. Zyglo -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td style="padding-left: 20px;">c. Kerosene -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Inspected head for warpage beyond specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Inspected gasket surfaces for roughness -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Repaired, serviced or replaced defective cylinder head -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing cylinder head -	_____	_____	2. Disassembled cylinder head -	_____	_____	3. Cleaned cylinder head -	_____	_____	4. Inspected head for cracks using:			a. Magnaflux -	_____	_____	b. Zyglo -	_____	_____	c. Kerosene -	_____	_____	5. Inspected head for warpage beyond specifications -	_____	_____	6. Inspected gasket surfaces for roughness -	_____	_____	7. Repaired, serviced or replaced defective cylinder head -	_____	_____
Achievement Indicators: The learner:	Yes	No																																	
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7. Repaired, serviced or replaced defective cylinder head -	_____	_____																																	
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cylinder heads are tested according to manufacturer's specifications to detect cracks and warpage.																																			
Tools and Equipment: Magnaflux Tester Zyglo Kit Straight Edge	Resources:																																		

Duty: Certification: Engine Repair (Cylinder Head)	Duty No. 0
	Task No. 8

Task: Rebuild cylinder head using appropriate equipment to restore cylinder head operation.

Achievement Indicators: The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to rebuild cylinder head -	_____	_____
2. Removed valves and springs from head keeping them in proper sequence -	_____	_____
3. Inspected valve springs for squareness and tension replaced as necessary -	_____	_____
4. Cleaned valves, cylinder head, valve guides, springs, retainers and keepers -	_____	_____
5. Inspected valves for valve-face excentricity, margin, stem wear, cracked or burned heads -	_____	_____
6. Ground servicable valves face and stem tip if necessary -	_____	_____
7. Replaced or serviced worn valve guides -	_____	_____
8. Measured valve guide wear -	_____	_____
9. Replaced or serviced worn valve guides -	_____	_____
10. Inspected valve seats for cracks and other damages -	_____	_____
11. Replaced or ground valve seats to proper width -	_____	_____
12. Checked ground or replaced valve for concentricity -	_____	_____
13. Checked fit of valve and valve-seat with prussian blue -	_____	_____
14. Checked installed valve spring height -	_____	_____
15. Compared to specification -	_____	_____
16. Shimmed valve springs to obtain correct valve spring height -	_____	_____
17. Installed valve seals and reassembled cylinder head -	_____	_____
18. Checked rocker arm's ball studs and push rods for wear and damage -	_____	_____
19. Replaced all worn or damaged parts -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cylinder head is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Valve Grinding Equipment

Resources:

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0																																													
		Task No. 9																																													
Task: Replace harmonic balancer using appropriate equipment to restore harmonic balancer operation.																																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed components necessary to gain access to balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed belts and pulley from balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed the harmonic balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed timing chain cover and seal -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed new front seal and timing cover gasket -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed new harmonic balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Installed belts and pulley on balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Installed components removed to gain access to balancer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Started engine and checked for oil leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure -		_____	_____	2. Removed components necessary to gain access to balancer -		_____	_____	3. Removed belts and pulley from balancer -		_____	_____	4. Removed the harmonic balancer -		_____	_____	5. Removed timing chain cover and seal -		_____	_____	6. Installed new front seal and timing cover gasket -		_____	_____	7. Installed new harmonic balancer -		_____	_____	8. Installed belts and pulley on balancer -		_____	_____	9. Installed components removed to gain access to balancer -		_____	_____	10. Started engine and checked for oil leaks -		_____	_____
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10. Started engine and checked for oil leaks -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and harmonic balancer is replaced according to manufacturer's specifications and so all hardware is torqued and front seal does not leak.																																															
Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0	
		Task No. 10	
Task: Replace timing chain or belt using appropriate equipment to restore timing chain or belt.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure -		_____	_____
2. Removed components necessary to gain access to chain or belt -		_____	_____
3. Removed timing chain or belt cover -		_____	_____
4. Aligned timing marks according to specifications -		_____	_____
5. Removed timing chain or belt -		_____	_____
6. Inspected timing gears and belt tensioner -		_____	_____
7. Replaced all worn or damaged parts -		_____	_____
8. Installed timing chain or belt -		_____	_____
9. Checked timing marks and readjusted if necessary -		_____	_____
10. Installed timing or belt cover -		_____	_____
11. Installed all components removed to gain access to chain or belt -		_____	_____
12. Started engine, adjusted timing and idle speed -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and timing chain or belt is replaced so all hardware is torqued and oil does not leak.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Engine Repair (Cylinder Head)		Duty No. 0																																							
		Task No. 12																																							
Task: Replace camshaft using appropriate equipment to restore camshaft operation.																																									
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators: The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 15%;">No</th> </tr> <tr><td>1. Referred to manufacturer's repair manual for correct procedure -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>2. Removed front timing cover and fuel pump -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>3. Removed timing chain and gears</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>4. Removed push rods and rocker arm assembly -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>5. Removed valve lifters -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>6. Removed camshaft -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>7. Installed camshaft and checked end play -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>8. Installed timing chain, sprockets, seals, gaskets and timing cover -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>9. Installed new lifters, push rods and rocker assembly -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>10. Adjusted valves -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>11. Started engine, set timing, engine idle and readjusted valves -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>12. Checked for any oil or fluid leaks -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure -	_____	_____	2. Removed front timing cover and fuel pump -	_____	_____	3. Removed timing chain and gears	_____	_____	4. Removed push rods and rocker arm assembly -	_____	_____	5. Removed valve lifters -	_____	_____	6. Removed camshaft -	_____	_____	7. Installed camshaft and checked end play -	_____	_____	8. Installed timing chain, sprockets, seals, gaskets and timing cover -	_____	_____	9. Installed new lifters, push rods and rocker assembly -	_____	_____	10. Adjusted valves -	_____	_____	11. Started engine, set timing, engine idle and readjusted valves -	_____	_____	12. Checked for any oil or fluid leaks -	_____	_____
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5. Removed valve lifters -	_____	_____																																							
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and camshaft is replaced according to manufacturer's specifications.																																									
Tools and Equipment: Advanced Tool Set	Resources:																																								

Duty: Certification: Engine Repair (Cylinder Head)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="text-align: center; padding: 2px 5px;">0</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="text-align: center; padding: 2px 5px;">13</td> </tr> </table>	Duty No.	0	Task No.	13																																									
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Task: Replace camshaft bearings using appropriate equipment to restore camshaft bearing operation.																																														
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and camshaft bearings are replaced according to manufacturer's directions.

Tools and Equipment:

Advanced Tool Set
Camshaft Bearing
Installer

Resources:

Duty: Certification: Engine Repair (Exhaust Sytem)		Duty No. P																			
		Task No. 1																			
Task: Check exhaust sytem for leaks and restrictions using appropriate equipment to detect leaks and restrictions.																					
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure for checking exhaust system for leaks and restrictions - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Connected vacuum gauge to intake manifold - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Performed exhaust restriction test - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Checked all joints, gaskets, pipes and mufflers for leaks - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Repaired or replaced all defective components - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for checking exhaust system for leaks and restrictions -	_____	_____	2. Connected vacuum gauge to intake manifold -	_____	_____	3. Performed exhaust restriction test -	_____	_____	4. Checked all joints, gaskets, pipes and mufflers for leaks -	_____	_____	5. Repaired or replaced all defective components -	_____	_____
Achievement Indicators: The learner:	Yes	No																			
1. Referred to manufacturer's repair manual for correct procedure for checking exhaust system for leaks and restrictions -	_____	_____																			
2. Connected vacuum gauge to intake manifold -	_____	_____																			
3. Performed exhaust restriction test -	_____	_____																			
4. Checked all joints, gaskets, pipes and mufflers for leaks -	_____	_____																			
5. Repaired or replaced all defective components -	_____	_____																			
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and exhaust system is checked according to manufacturer's specifications to detect leaks and restrictions.																					
Tools and Equipment: Basic Tool Set Vacuum Gauge		Resources: 433																			

Duty: Certification: Engine Repair (Exhaust System)		Duty No. p
		Task No. 3
Task: Replace muffler using appropriate equipment to replace muffler.		
Achievement Indicators: The learner:		Yes No
1. Referred to manufacturer's repair manual for correct procedure for replacing muffler -		_____
2. Raised vehicle on suitable lift or stands -		_____
3. Removed the necessary clamps and hangers to remove tailpipes -		_____
4. Using a cutting or heating device, removed the tailpipes -		_____
5. Using a cutting or heating device, removed the muffler -		_____
6. Installed muffler and pipes in the reverse order, making certain pipes and mufflers were clear of chassis and axle to avoid possible rattle -		_____
7. Operational tested the exhaust system -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and muffler is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources: 435	

Duty: Certification: Engine Repair (Exhaust System)		Duty No. P
		Task No. 4
Task: Replace tailpipe using appropriate equipment to replace a tailpipe to manufacturer's specifications.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing tailpipe -	_____	_____
2. Raised vehicle and placed on jack stands -	_____	_____
3. Disconnected tailpipe assembly from muffler -	_____	_____
4. Replaced tailpipe sections, checking and/or replacing hangers and clamps as needed -	_____	_____
5. Reconnected tailpipe and muffler assembly -	_____	_____
6. Lowered vehicle and road tested for leaks, rattles, and clearances -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and tailpipe is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources: 436	

Duty: Certification: Engine Repair (Exhaust System)		Duty No. p	
		Task No. 5	
Task: Replace exhaust pipe using appropriate equipment to replace an exhaust pipe.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace an exhaust sytem -		_____	_____
2. Raised and supported the vehicle -		_____	_____
3. Disconnected the exhaust pipe from the exhaust manifold -		_____	_____
4. Disconnected the muffler from the exhaust pipe -		_____	_____
5. Connected the new exhaust pipe and gaskets to the muffler and exhaust manifold -		_____	_____
6. Aligned exhaust system and torqued all nuts and bolts -		_____	_____
7. Checked system for leaks, rattles, and clearances -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and exhaust pipe is replaced according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources: 437	

Duty: Certification: Engine Repair (Exhaust System)		Duty No. p
		Task No. 6
Task: Replace exhaust manifold using appropriate equipment to replace an exhaust manifold.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing exhaust manifold -	_____	_____
2. Raised and supported the vehicle -	_____	_____
3. Disconnected the exhaust pipe from the exhaust manifold -	_____	_____
4. Disconnected the exhaust manifold from cylinder head -	_____	_____
5. Cleaned all sealing surfaces -	_____	_____
6. Installed replacement manifold and gaskets -	_____	_____
7. Connected exhaust pipe to manifold and torqued cap screws -	_____	_____
8. Aligned and torqued all mounting nuts and bolts -	_____	_____
9. Started engine and checked for leaks -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and exhaust manifold is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources: 438	

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																									
		Task No. 1																									
Task: Adjust manual clutch using appropriate equipment to restore manual clutch operation.																											
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure for adjusting a clutch - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Checked clutch pedal free travel - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Compared clutch free travel with manufacturer's specifications and adjusted if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Located adjuster on clutch linkage - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Loosened jam nut and lengthened or shortened rod to reestablish proper amount of clutch play - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Retightened jam nut and rechecked clutch free play - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Checked for proper operation - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for adjusting a clutch -	_____	_____	2. Checked clutch pedal free travel -	_____	_____	3. Compared clutch free travel with manufacturer's specifications and adjusted if necessary -	_____	_____	4. Located adjuster on clutch linkage -	_____	_____	5. Loosened jam nut and lengthened or shortened rod to reestablish proper amount of clutch play -	_____	_____	6. Retightened jam nut and rechecked clutch free play -	_____	_____	7. Checked for proper operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																									
1. Referred to manufacturer's repair manual for correct procedure for adjusting a clutch -	_____	_____																									
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7. Checked for proper operation -	_____	_____																									
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a manual clutch is adjusted according to manufacturer's specifications.																											
Tools and Equipment: Basic Tool Set	Resources: 439																										

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																												
		Task No. 2																												
Task: Adjust hydraulic clutch free travel using appropriate equipment to restore hydraulic clutch free travel operation.																														
<table border="0"> <tr> <td>Achievement Indicators: The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for adjusting an hydraulic clutch -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked clutch pedal height from clutch pedal pad to floor board -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Checked clutch fork clearance from push rod to clutch fork -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Compared clearances with manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Adjusted clutch pedal height and fork clearance to manufacturer's specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Checked free travel and compared to specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Readjusted if necessary -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked clutch operation -</td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for adjusting an hydraulic clutch -	_____	_____	2. Checked clutch pedal height from clutch pedal pad to floor board -	_____	_____	3. Checked clutch fork clearance from push rod to clutch fork -	_____	_____	4. Compared clearances with manufacturer's specifications -	_____	_____	5. Adjusted clutch pedal height and fork clearance to manufacturer's specifications -	_____	_____	6. Checked free travel and compared to specifications -	_____	_____	7. Readjusted if necessary -	_____	_____	8. Checked clutch operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																												
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2. Checked clutch pedal height from clutch pedal pad to floor board -	_____	_____																												
3. Checked clutch fork clearance from push rod to clutch fork -	_____	_____																												
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6. Checked free travel and compared to specifications -	_____	_____																												
7. Readjusted if necessary -	_____	_____																												
8. Checked clutch operation -	_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and hydraulic clutch is adjusted according to manufacturer's specifications with no slippage or grinding when gears are shifted.																														
Tools and Equipment: Basic Tool Set		Resources:  440																												

Duty: Certification: Manual Transmission, Front and Rear Axles		Duty No. Q																													
		Task No. 3																													
Task: Adjust shift linkage using appropriate equipment to restore shift linkage operation.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for adjusting shift linkage -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised hood and visually inspected linkage (on some vehicles, adjustments are on steering column; on others, the transmission) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. If on column, placed transmission in neutral, loosened clamps on linkage and adjusted to manufacturer's specifications. Retightened clamps, and tested for operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. If on transmission, jacked up vehicle and placed safety stands under frame -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Placed transmission in neutral, loosened linkage clamps, adjusted to manufacturer's specifications and retightened clamps -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Tested for operation; repeated process if linkage was still too loose or tight -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for adjusting shift linkage -		_____	_____	2. Raised hood and visually inspected linkage (on some vehicles, adjustments are on steering column; on others, the transmission) -		_____	_____	3. If on column, placed transmission in neutral, loosened clamps on linkage and adjusted to manufacturer's specifications. Retightened clamps, and tested for operation -		_____	_____	4. If on transmission, jacked up vehicle and placed safety stands under frame -		_____	_____	5. Placed transmission in neutral, loosened linkage clamps, adjusted to manufacturer's specifications and retightened clamps -		_____	_____	6. Tested for operation; repeated process if linkage was still too loose or tight -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Referred to manufacturer's repair manual for correct procedure for adjusting shift linkage -		_____	_____																												
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4. If on transmission, jacked up vehicle and placed safety stands under frame -		_____	_____																												
5. Placed transmission in neutral, loosened linkage clamps, adjusted to manufacturer's specifications and retightened clamps -		_____	_____																												
6. Tested for operation; repeated process if linkage was still too loose or tight -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the shift linkage is adjusted according to manufacturer's specifications.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Manual Transmission, Front and Rear Axle (Manual Transmissions)		Duty No. Q	
		Task No. 4	
Task: Replace extension housing seal and bushing using appropriate equipment to restore extension housing seal and bushing operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace extension housing seal and bushing -		_____	_____
2. Drained transmission -		_____	_____
3. Removed drive shaft (NOTE: Some bushings can now be replaced) -		_____	_____
4. Removed speedometer cable from rear housing -		_____	_____
5. Removed output shaft housing from transmission (NOTE: If transmission mount attaches to housing, transmission must be supported by a jack) -		_____	_____
6. Using proper tools, removed and replaced seal and bushing -		_____	_____
7. Installed housing using new gaskets -		_____	_____
8. Installed drive shaft -		_____	_____
9. Refilled transmission -		_____	_____
10. Tested and checked for leaks or excessive noise -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and extension housing seal and bushing are replaced according to manufacturer's specifications with no fluid leaks.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)	Duty No. Q																																																	
	Task No. 5																																																	
Task: Replace manual transmission using appropriate equipment to restore manual transmission operation.																																																		
<table border="0"> <thead> <tr> <th>Achievement Indicators: The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace a manual transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Drained transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed drive shaft -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed shift linkage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Removed speedometer cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Supported engine and transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Removed transmission to bell housing bolts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Removed transmission mounts -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Removed transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Installed transmission, bolts, and mounts and torqued all hardware -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Reinstalled speedometer cable, shift linkage and drive shaft -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Adjusted shift linkage and clutch linkage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>14. Refilled transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>15. Checked for leaks and proper operation -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace a manual transmission -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Drained transmission -	_____	_____	4. Removed drive shaft -	_____	_____	5. Removed shift linkage -	_____	_____	6. Removed speedometer cable -	_____	_____	7. Supported engine and transmission -	_____	_____	8. Removed transmission to bell housing bolts -	_____	_____	9. Removed transmission mounts -	_____	_____	10. Removed transmission -	_____	_____	11. Installed transmission, bolts, and mounts and torqued all hardware -	_____	_____	12. Reinstalled speedometer cable, shift linkage and drive shaft -	_____	_____	13. Adjusted shift linkage and clutch linkage -	_____	_____	14. Refilled transmission -	_____	_____	15. Checked for leaks and proper operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																																																
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a manual transmission is replaced according to manufacturer's specifications with all hardware torqued, proper fluid level and no linkage binding.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles	Duty No. Q																																	
	Task No. 6																																	
Task: Replace pressure plate assembly using appropriate equipment to restore pressure plate operation.																																		
Achievement Indicators:	The learner:	<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a pressure plate assembly is replaced according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																																													
		Task No. 7																																													
Task: Replace and align clutch disc using appropriate equipment to restore clutch operation.																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace a clutch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised vehicle to gain access to drive line and transmission -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed components necessary to gain access to clutch disc -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed pressure plate assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inspected flywheel, release bearing, pilot bearing, release fork and pressure plate assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Replaced worn or damaged components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced and aligned clutch disc -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reinstalled components removed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Adjusted clutch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Checked operation of clutch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace a clutch -		_____	_____	2. Raised vehicle to gain access to drive line and transmission -		_____	_____	3. Removed components necessary to gain access to clutch disc -		_____	_____	4. Removed pressure plate assembly -		_____	_____	5. Inspected flywheel, release bearing, pilot bearing, release fork and pressure plate assembly -		_____	_____	6. Replaced worn or damaged components -		_____	_____	7. Replaced and aligned clutch disc -		_____	_____	8. Reinstalled components removed -		_____	_____	9. Adjusted clutch -		_____	_____	10. Checked operation of clutch -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																												
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2. Raised vehicle to gain access to drive line and transmission -		_____	_____																																												
3. Removed components necessary to gain access to clutch disc -		_____	_____																																												
4. Removed pressure plate assembly -		_____	_____																																												
5. Inspected flywheel, release bearing, pilot bearing, release fork and pressure plate assembly -		_____	_____																																												
6. Replaced worn or damaged components -		_____	_____																																												
7. Replaced and aligned clutch disc -		_____	_____																																												
8. Reinstalled components removed -		_____	_____																																												
9. Adjusted clutch -		_____	_____																																												
10. Checked operation of clutch -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the clutch is replaced and aligned according to manufacturer's specifications.																																															
Tools and Equipment: Advanced Tool Set		Resources:																																													

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																																					
		Task No. 8																																					
Task: Replace clutch release bearing using appropriate equipment to restore clutch bearing operation.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td colspan="2">1. Referred to manufacturer's repair manual for correct procedure to replace a clutch release bearing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">2. Raised vehicle to gain access to drive line and transmission -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">3. Removed drive shaft -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">4. Removed transmission according to manufacturer's instructions -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">5. Removed and replaced clutch release bearings -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">6. Reinstalled transmission following specifications; corrected and adjusted linkage -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">7. Checked transmission fluid level and refilled if necessary -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td colspan="2">8. Road checked vehicle for correct operation of clutch and gear shifting of transmission -</td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace a clutch release bearing -		_____	_____	2. Raised vehicle to gain access to drive line and transmission -		_____	_____	3. Removed drive shaft -		_____	_____	4. Removed transmission according to manufacturer's instructions -		_____	_____	5. Removed and replaced clutch release bearings -		_____	_____	6. Reinstalled transmission following specifications; corrected and adjusted linkage -		_____	_____	7. Checked transmission fluid level and refilled if necessary -		_____	_____	8. Road checked vehicle for correct operation of clutch and gear shifting of transmission -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																				
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7. Checked transmission fluid level and refilled if necessary -		_____	_____																																				
8. Road checked vehicle for correct operation of clutch and gear shifting of transmission -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a clutch release bearing is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Advanced Tool Set		Resources:																																					

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																												
		Task No. 9																												
Task: Replace clutch release fork using appropriate equipment to restore clutch release fork operation.																														
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to replace a clutch release fork - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Raised vehicle to gain access to drive line and transmission - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed drive shaft - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Removed transmission according to manufacturer's directions - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Removed and replaced clutch release fork - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Reinstalled transmission following specifications; corrected and adjusted linkage - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Checked transmission fluid level and refilled if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Road checked vehicle for correct operation of clutch and gear shifting of transmission - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace a clutch release fork -	_____	_____	2. Raised vehicle to gain access to drive line and transmission -	_____	_____	3. Removed drive shaft -	_____	_____	4. Removed transmission according to manufacturer's directions -	_____	_____	5. Removed and replaced clutch release fork -	_____	_____	6. Reinstalled transmission following specifications; corrected and adjusted linkage -	_____	_____	7. Checked transmission fluid level and refilled if necessary -	_____	_____	8. Road checked vehicle for correct operation of clutch and gear shifting of transmission -	_____	_____
Achievement Indicators: The learner:	Yes	No																												
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2. Raised vehicle to gain access to drive line and transmission -	_____	_____																												
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4. Removed transmission according to manufacturer's directions -	_____	_____																												
5. Removed and replaced clutch release fork -	_____	_____																												
6. Reinstalled transmission following specifications; corrected and adjusted linkage -	_____	_____																												
7. Checked transmission fluid level and refilled if necessary -	_____	_____																												
8. Road checked vehicle for correct operation of clutch and gear shifting of transmission -	_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a clutch release fork is replaced according to manufacturer's specifications.																														
Tools and Equipment: Advanced Tool Set	Resources:																													

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q	
		Task No. 10	
Task: Replace pilot bearing using appropriate equipment to restore pilot bearing operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace a pilot bearing -		_____	_____
2. Raised and supported vehicle -		_____	_____
3. Removed drive shaft -		_____	_____
4. Removed transmission using proper jack -		_____	_____
5. Removed clutch bearing, pressure plate and disc -		_____	_____
6. Removed pilot bearing from flywheel using correct puller -		_____	_____
7. Inspected end of crank for wear -		_____	_____
8. Installed new pilot bearing -		_____	_____
9. Installed clutch, using aligning tool -		_____	_____
10. Installed transmission -		_____	_____
11. Installed drive shaft -		_____	_____
12. Checked fluid level and adjusted if necessary -		_____	_____
13. Tested for operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a pilot bearing is replaced according to manufacturer's specifications and so the bearing does not squeal.			
Tools and Equipment: Advanced Tool Set		Resources:	

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q	
		Task No. 11	
Task: Test flywheel runout using appropriate equipment to detect any flywheel runout deviations.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing flywheel runout -		_____	_____
2. Removed transmission and clutch assembly -		_____	_____
3. Mounted dial indicator to clutch housing -		_____	_____
4. Measured flywheel runout and compared with specifications -		_____	_____
5. Measured crankshaft runout and compared with specifications-		_____	_____
6. Inspected flywheel for cracks, scoring, hard spots, discoloration and corrosion; serviced as required -		_____	_____
7. Inspected ring gear for damage; serviced as required -		_____	_____
8. Installed clutch assembly and standard transmission -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and flywheel runout is tested according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set Dial Indicator		Resources:	

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)	Duty No. Q																																																
Task No. 12																																																	
Task: Replace flywheel using appropriate equipment to restore flywheel operation.																																																	
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 20%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing flywheel -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Disconnected battery ground cable -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Removed starter -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Removed drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed transmission (NOTE: Be sure to support engine) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed clutch housing -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Removed clutch assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Removed flywheel -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Installed flywheel and torqued all hardware -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Checked flywheel runout; adjusted if necessary -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Installed clutch housing and clutch assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Installed transmission and drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Adjusted clutch and transmission linkage -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Reinstalled starter and battery ground cable -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>15. Checked for proper operation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing flywheel -	_____	_____	2. Disconnected battery ground cable -	_____	_____	3. Removed starter -	_____	_____	4. Removed drive shaft -	_____	_____	5. Removed transmission (NOTE: Be sure to support engine) -	_____	_____	6. Removed clutch housing -	_____	_____	7. Removed clutch assembly -	_____	_____	8. Removed flywheel -	_____	_____	9. Installed flywheel and torqued all hardware -	_____	_____	10. Checked flywheel runout; adjusted if necessary -	_____	_____	11. Installed clutch housing and clutch assembly -	_____	_____	12. Installed transmission and drive shaft -	_____	_____	13. Adjusted clutch and transmission linkage -	_____	_____	14. Reinstalled starter and battery ground cable -	_____	_____	15. Checked for proper operation -	_____	_____
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15. Checked for proper operation -	_____	_____																																															

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and flywheel is replaced according to manufacturer's specifications and so that all hardware is torqued and no vibration from flywheel imbalance.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)	Duty No. Q
	Task No. 13

Task: Test bellhousing runout using appropriate equipment to detect any deviation from manufacturer's specifications.

Achievement Indicators: The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing bellhousing -	_____	_____
2. Removed drive shaft, transmission, clutch assembly and clutch linkage -	_____	_____
3. Substituted a 3" cap screw for one of the flywheel cap screws -	_____	_____
4. Mounted dial indicator on cap screw with a c-clamp -	_____	_____
5. Centered indicator in the bore -	_____	_____
6. Rotated engine slowly clockwise to check runout -	_____	_____
7. Corrected excessive runout with off set dowel pins -	_____	_____
8. Checked housing-face squareness -	_____	_____
9. Adjusted with shim stock between clutch housing and engine block if necessary -	_____	_____
10. Reinstalled clutch linkage, clutch assembly, transmission and drive shaft -	_____	_____
11. Adjusted clutch and transmission linkage -	_____	_____
12. Tested for proper operation -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and bellhousing is tested according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set
Dial Indicator

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q	
		Task No. 14	
Task: Rebuild manual transmission using appropriate equipment to restore manual transmission operation.			
Achievement Indicators: The learner:		Yes	No
1. Located manufacturer's information and specifications on the transmission -		_____	_____
2. Removed transmission cover and visually inspected all visible gears, synchronizers, and spacers -		_____	_____
3. Disassembled transmission and checked parts for nicks, burrs, or broken gear teeth -		_____	_____
4. Checked cluster gear for correct thickness spacers with a caliper micrometer against manufacturer's recommended thickness -		_____	_____
5. Checked all other components in transmission for wear, leaks, or other problems -		_____	_____
6. Reassembled transmission and tested for proper functioning -		_____	_____
7. Installed transmission in vehicle -		_____	_____
8. Installed speedometer cable, shift linkage and drive shaft -		_____	_____
9. Adjusted shift linkage -		_____	_____
10. Refilled transmission -		_____	_____
11. Checked for leaks and proper operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a manual transmission is rebuilt according to manufacturer's specifications.			
Tools and Equipment:		Resources:	
Advanced Tool Set			

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																																					
		Task No. 15																																					
Task: Replace hydraulic clutch slave cylinder using appropriate equipment to restore hydraulic clutch slave cylinder operation.																																							
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for the correct procedure to replace a clutch slave cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Loosened clutch cylinder push rod - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Removed return spring - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Removed hydraulic line from cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Removed mounting screws and slave cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Reinstalled new slave cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Reattached hydraulic line to cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Attached return spring and push rod - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 9. Bled system - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 10. Adjusted clutch pedal height and play - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 11. Checked for proper operation - </td> <td> _____ </td> <td> _____ </td> </tr> </table>				Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for the correct procedure to replace a clutch slave cylinder -	_____	_____	2. Loosened clutch cylinder push rod -	_____	_____	3. Removed return spring -	_____	_____	4. Removed hydraulic line from cylinder -	_____	_____	5. Removed mounting screws and slave cylinder -	_____	_____	6. Reinstalled new slave cylinder -	_____	_____	7. Reattached hydraulic line to cylinder -	_____	_____	8. Attached return spring and push rod -	_____	_____	9. Bled system -	_____	_____	10. Adjusted clutch pedal height and play -	_____	_____	11. Checked for proper operation -	_____	_____
Achievement Indicators: The learner:	Yes	No																																					
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9. Bled system -	_____	_____																																					
10. Adjusted clutch pedal height and play -	_____	_____																																					
11. Checked for proper operation -	_____	_____																																					
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a clutch slave cylinder is replaced according to manufacturer's specifications and so the cylinder does not leak and first gear engages smoothly.																																							
Tools and Equipment: Advanced Tool Set		Resources:																																					

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No. Q</td> </tr> <tr> <td style="padding: 2px 5px;">Task No. 16</td> </tr> </table>	Duty No. Q	Task No. 16																																																						
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Task No. 16																																																									
Task: Rebuild hydraulic clutch slave cylinder using appropriate equipment to restore hydraulic clutch slave cylinder operation.																																																									
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 60%;">Achievement Indicators:</th> <th style="text-align: left; width: 20%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for rebuilding hydraulic clutch slave cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Disassembled slave cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Visually inspected piston seals and cylinder bore for wear, damaged or corroded parts -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Honed hydraulic slave cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Cleaned all components with alcohol -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Replaced all worn seals, damaged or corroded parts -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Reassembled slave cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Reinstalled rebuilt slave cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Reattached hydraulic line to cylinder -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Attached return spring and pushrod -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Bled system -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Adjusted clutch pedal height and play -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Checked for leaks and proper operation -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for rebuilding hydraulic clutch slave cylinder -		_____	_____	2. Disassembled slave cylinder -		_____	_____	3. Visually inspected piston seals and cylinder bore for wear, damaged or corroded parts -		_____	_____	4. Honed hydraulic slave cylinder -		_____	_____	5. Cleaned all components with alcohol -		_____	_____	6. Replaced all worn seals, damaged or corroded parts -		_____	_____	7. Reassembled slave cylinder -		_____	_____	8. Reinstalled rebuilt slave cylinder -		_____	_____	9. Reattached hydraulic line to cylinder -		_____	_____	10. Attached return spring and pushrod -		_____	_____	11. Bled system -		_____	_____	12. Adjusted clutch pedal height and play -		_____	_____	13. Checked for leaks and proper operation -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a hydraulic slave cylinder is rebuilt according to manufacturer's specifications and so that the cylinder does not leak and first gear engages smoothly.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)		Duty No. Q																											
		Task No. 17																											
Task: Replace hydraulic clutch master cylinder using appropriate equipment to restore hydraulic clutch master cylinder operation.																													
<table border="0"> <tr> <td> Achievement Indicators: The learner: </td> <td> Yes </td> <td> No </td> </tr> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure for replacing hydraulic clutch master cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 2. Removed cylinder mounting bolts and hydraulic line - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 3. Filled replacement master cylinder with proper hydraulic fluid - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 4. Bench bled master cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 5. Reinstalled clutch master cylinder, mounting bolts and hydraulic line - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 6. Bled system at clutch slave cylinder - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 7. Checked clutch adjustment pedal height and pushrod clearance; adjusted if necessary - </td> <td> _____ </td> <td> _____ </td> </tr> <tr> <td> 8. Checked for leaks and proper operation - </td> <td> _____ </td> <td> _____ </td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing hydraulic clutch master cylinder -	_____	_____	2. Removed cylinder mounting bolts and hydraulic line -	_____	_____	3. Filled replacement master cylinder with proper hydraulic fluid -	_____	_____	4. Bench bled master cylinder -	_____	_____	5. Reinstalled clutch master cylinder, mounting bolts and hydraulic line -	_____	_____	6. Bled system at clutch slave cylinder -	_____	_____	7. Checked clutch adjustment pedal height and pushrod clearance; adjusted if necessary -	_____	_____	8. Checked for leaks and proper operation -	_____	_____
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8. Checked for leaks and proper operation -	_____	_____																											
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a hydraulic clutch and master cylinder is replaced according to manufacturer's specifications and so that cylinder does not leak and first gear engages smoothly.																													
Tools and Equipment: Basic Tool Set	Resources:																												

Duty: Certification: Manual Transmission, Front and Rear Axles (Manual Transmissions)	Duty No. Q																																											
	Task No. 18																																											
Task: Rebuild hydraulic clutch master cylinder using appropriate equipment to restore hydraulic clutch master cylinder operation.																																												
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a hydraulic clutch master cylinder is rebuilt according to manufacturer's specifications and so that cylinder does not leak and first gear engages smoothly.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R	
		Task No. 1	
Task: Test drive line using appropriate equipment to detect all parts worn beyond manufacturer's specifications.			
Achievement Indicators: The learner:		Yes	No
1. Raised and supported vehicle -		_____	_____
2. Removed drive shaft -		_____	_____
3. Removed center bearing snap ring and bearing assembly -		_____	_____
4. Checked U-joints on drive shaft for wear, oil leakage, and excessive play -		_____	_____
5. Checked center bearing for wear and looseness -		_____	_____
6. Checked slip joint for wear -		_____	_____
7. Cleaned and relubricated U-joints and center bearing with recommended lubricants -		_____	_____
8. Replaced U-joints and center bearing assembly as needed -		_____	_____
9. Reinstalled drive shaft and checked alignment -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the drive line is tested according to manufacturer's specifications to detect all worn parts.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R Task No. 2	
Task: Lubricate universal joints using appropriate equipment to restore universal joint operation.			
Achievement Indicators: The learner: 1. Raised vehicle to allow access to drive shaft - 2. Lubricated U-joint if it was provided with grease fittings - 3. Checked seals and joints - 4. Road tested to check performance -		Yes _____ _____ _____ _____ _____	No _____ _____ _____ _____ _____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the universal joints are lubricated according to manufacturer's specifications and so the joint moves freely with no binding.			
Tools and Equipment: Basic Tool Set	Resources:		

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R																																									
		Task No. 3																																									
Task: Replace universal joints using appropriate equipment to restore universal joint operation.																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The Learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Raised vehicle to allow access to drive shaft -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed drive shaft; marked for proper alignment -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed U-joint clips or locking device -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Disassembled U-joint using U-joint press or vise -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Before installing new joint, checked to determine if it had ample lubrication -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Installed replacement U-joint -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed clips or locking devices being sure they were properly located and seated -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reinstalled drive shaft in vehicle -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Road tested to check performance -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The Learner:	Yes	No	1. Raised vehicle to allow access to drive shaft -		_____	_____	2. Removed drive shaft; marked for proper alignment -		_____	_____	3. Removed U-joint clips or locking device -		_____	_____	4. Disassembled U-joint using U-joint press or vise -		_____	_____	5. Before installing new joint, checked to determine if it had ample lubrication -		_____	_____	6. Installed replacement U-joint -		_____	_____	7. Installed clips or locking devices being sure they were properly located and seated -		_____	_____	8. Reinstalled drive shaft in vehicle -		_____	_____	9. Road tested to check performance -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the universal joints are replaced according to manufacturer's specifications and the joint moves freely with no binding.																																											
Tools and Equipment: Basic Tool Set	Resources:																																										

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R
	Task No. 4

Task: Replace trunion joints using appropriate equipment to restore trunion joint operation.

Achievement Indicators:	The learner:	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace ball and trunion joints -		_____	_____
2. Raised and supported vehicle by frame -		_____	_____
3. Removed drive shaft from vehicle -		_____	_____
4. Removed grease cover and gasket -		_____	_____
5. Removed thrust button, spring, ball, rollers and thrust washer from each end of pin -		_____	_____
6. Removed clamps and loosened dust cover -		_____	_____
7. Pressed out trunion pin -		_____	_____
8. Cleaned and inspected all parts for wear -		_____	_____
9. Replaced all worn or damaged components -		_____	_____
10. Reinstalled boot clamps and body on drive shaft -		_____	_____
11. Pressed trunion pin through end of propeller shaft so pin was exactly centered -		_____	_____
12. Assembled thrust button, spring, ball, rollers and thrust washer -		_____	_____
13. Placed boot on body and installed clamp -		_____	_____
14. Lubricated trunion joint with correct type and quantity -		_____	_____
15. Installed grease cover and gasket -		_____	_____
16. Reinstalled drive shaft -		_____	_____
17. Lowered vehicle to floor -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the trunion joints are replaced according to manufacturer's specifications with the trunion pin centered, joint moving freely and with the proper amount of grease added.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R																																				
		Task No. 5																																				
Task: Lubricate speedometer cable using appropriate equipment to restore speedometer cable operation.																																						
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Located manufacturer's information on vehicle specifying speedometer lubrication -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2.</td> <td>Determined cable routing and location of securing clips -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3.</td> <td>Removed speedometer cable and housing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4.</td> <td>Lubricated speedometer cable as required -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5.</td> <td>Checked speedometer cable and housing for kinks before installing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6.</td> <td>Checked speedometer head for possible binding problems -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7.</td> <td>Reconnected cable to head and replaced securing clips -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8.</td> <td>Road tested to check speedometer operation -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1.	Located manufacturer's information on vehicle specifying speedometer lubrication -	_____	_____	2.	Determined cable routing and location of securing clips -	_____	_____	3.	Removed speedometer cable and housing -	_____	_____	4.	Lubricated speedometer cable as required -	_____	_____	5.	Checked speedometer cable and housing for kinks before installing -	_____	_____	6.	Checked speedometer head for possible binding problems -	_____	_____	7.	Reconnected cable to head and replaced securing clips -	_____	_____	8.	Road tested to check speedometer operation -	_____	_____
Achievement Indicators:	The learner:	Yes	No																																			
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8.	Road tested to check speedometer operation -	_____	_____																																			
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the speedometer cable is lubricated according to manufacturer's specifications so that the cable does not make noise or fluctuate at road speeds.																																						
Tools and Equipment: Basic Tool Set	Resources:																																					

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R Task No. 6																													
Task: Replace speedometer cable using appropriate equipment to restore speedometer cable operation.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Located manufacturer's information on vehicle specifying speedometer cable service or replacement -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Determined cable routing (to transmission or front wheel, etc.) and location of securing clips if so equipped -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed speedometer cable and housing -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Replaced speedometer cable and housing as required (NOTE: if broken cable is reason for servicing, cause of damage should be determined before a new cable is installed) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced any locking devices removed -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Road tested to check speedometer operation -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Located manufacturer's information on vehicle specifying speedometer cable service or replacement -		_____	_____	2. Determined cable routing (to transmission or front wheel, etc.) and location of securing clips if so equipped -		_____	_____	3. Removed speedometer cable and housing -		_____	_____	4. Replaced speedometer cable and housing as required (NOTE: if broken cable is reason for servicing, cause of damage should be determined before a new cable is installed) -		_____	_____	5. Replaced any locking devices removed -		_____	_____	6. Road tested to check speedometer operation -		_____	_____
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6. Road tested to check speedometer operation -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the speedometer cable is replaced according to manufacturer's specifications and the cable does not make noise or fluctuate at road speeds.																															
Tools and Equipment: Basic Tool Set	Resources:																														

Duty: Certification: Manual Transmission, Front and Rear Axles
(Drive Lines)

Duty No. R

Task No. 7

Task: Replace speedometer drive gear using appropriate equipment to restore speedometer drive gear operation.

Achievement Indicators:	The learner:	Yes	No
1. Located manufacturer's information on vehicle with malfunctioning speedometer drive gear -		_____	_____
2. Removed speedometer drive gear according to manufacturer's instructions -		_____	_____
3. Counted number of teeth on gear and checked for manufacturer's part number -		_____	_____
4. Determined cause of broken drive gear and corrected -		_____	_____
5. Reinstalled drive gear and road tested vehicle -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the speedometer drive gear is replaced according to manufacturer's specifications and the speedometer registers appropriate speed relative to tire size.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="text-align: center; padding: 2px 5px;">R</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="text-align: center; padding: 2px 5px;">8</td> </tr> </table>	Duty No.	R	Task No.	8																																									
Duty No.	R																																													
Task No.	8																																													
Task: Replace axle seal using appropriate equipment to restore axle seal operation.																																														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 75%; text-align: left; padding: 5px;"> Achievement Indicators: The learner: </th> <th style="width: 12.5%; text-align: center; padding: 5px;">Yes</th> <th style="width: 12.5%; text-align: center; padding: 5px;">No</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">1. Referred to manufacturer's repair manual for correct procedure to replace axle seal -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">2. Raised and supported vehicle -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">3. Removed rear wheel and brake drum assembly -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">4. Removed rear axle bearing retaining bolts/or removed differential cover and pinion gear shaft lock screw, pinion shaft and C-lock -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">5. Removed axle shaft and inspected for wear -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">6. Removed rear axle seal -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">7. Installed new rear axle seal -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">8. Lubricated seal and axle shaft -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">9. Installed axle shaft -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">10. Installed rear axle bearing retaining bolts/or installed C-lock, pinion shaft lock screw and differential cover -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">11. Checked lubrication level and adjusted if necessary -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">12. Installed rear brake drum and wheel assembly -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">13. Inspected or replaced brake shoes -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> <tr> <td style="padding: 5px;">14. Lowered vehicle to floor and checked for fluid leaks -</td> <td style="text-align: center; padding: 5px;">_____</td> <td style="text-align: center; padding: 5px;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace axle seal -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed rear wheel and brake drum assembly -	_____	_____	4. Removed rear axle bearing retaining bolts/or removed differential cover and pinion gear shaft lock screw, pinion shaft and C-lock -	_____	_____	5. Removed axle shaft and inspected for wear -	_____	_____	6. Removed rear axle seal -	_____	_____	7. Installed new rear axle seal -	_____	_____	8. Lubricated seal and axle shaft -	_____	_____	9. Installed axle shaft -	_____	_____	10. Installed rear axle bearing retaining bolts/or installed C-lock, pinion shaft lock screw and differential cover -	_____	_____	11. Checked lubrication level and adjusted if necessary -	_____	_____	12. Installed rear brake drum and wheel assembly -	_____	_____	13. Inspected or replaced brake shoes -	_____	_____	14. Lowered vehicle to floor and checked for fluid leaks -	_____	_____
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14. Lowered vehicle to floor and checked for fluid leaks -	_____	_____																																												

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and the axle seal is replaced according to manufacturer's specifications so no leaks may be seen at seal.

Tools and Equipment:
Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R																																														
	Task No. 9																																														
Task: Replace rear axle bearing using appropriate equipment to restore rear axle bearing operation.																																															
<table border="0"> <thead> <tr> <th> Achievement Indicators: The learner: </th> <th> Yes </th> <th> No </th> </tr> </thead> <tbody> <tr> <td> 1. Referred to manufacturer's repair manual for correct procedure to replace rear axle bearing - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 2. Raised and supported vehicle - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 3. Removed rear wheel and brake drum assembly - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 4. Removed rear axle bearing retaining bolts/or remove differential cover and pinion gear shaft lock screw, pinion shaft and C-lock - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 5. Removed axle shaft and inspected for wear - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 6. Removed bearing retainer/or bearing seal - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 7. Removed bearing from axle shaft or differential housing - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 8. Installed bearing from axle shaft or differential housing - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 9. Installed axle shaft - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 10. Installed rear axle bearing retaining bolts/or installed C-lock, pinion shaft, pinion shaft lock screw and differential cover - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 11. Checked lubrication level and adjusted as necessary - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 12. Installed rear brake drum and wheel assembly - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 13. Lowered vehicle to floor - </td> <td> ____ </td> <td> ____ </td> </tr> <tr> <td> 14. Checked for fluid leaks and bearing noise - </td> <td> ____ </td> <td> ____ </td> </tr> </tbody> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace rear axle bearing -	____	____	2. Raised and supported vehicle -	____	____	3. Removed rear wheel and brake drum assembly -	____	____	4. Removed rear axle bearing retaining bolts/or remove differential cover and pinion gear shaft lock screw, pinion shaft and C-lock -	____	____	5. Removed axle shaft and inspected for wear -	____	____	6. Removed bearing retainer/or bearing seal -	____	____	7. Removed bearing from axle shaft or differential housing -	____	____	8. Installed bearing from axle shaft or differential housing -	____	____	9. Installed axle shaft -	____	____	10. Installed rear axle bearing retaining bolts/or installed C-lock, pinion shaft, pinion shaft lock screw and differential cover -	____	____	11. Checked lubrication level and adjusted as necessary -	____	____	12. Installed rear brake drum and wheel assembly -	____	____	13. Lowered vehicle to floor -	____	____	14. Checked for fluid leaks and bearing noise -	____	____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a rear axle bearing is replaced according to manufacturer's specifications and the bearing does not make noise and the seal does not leak.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R																																							
Task No. 10																																								
Task: Balance drive shaft in the car using appropriate equipment to restore drive shaft operation.																																								
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators: The learner:</th> <th style="width: 10%; text-align: center;">Yes</th> <th style="width: 15%; text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to balance drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Raised and supported vehicle -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Removed rear tire-and-wheel assemblies and brake drums (NOTE: Do not apply brakes with drums removed) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Started engine and brought vehicle speed to vibration point -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Brought a crayon or colored pencil up to rear of rotating drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Touched shaft with crayon; (NOTE: If shaft is unbalanced, mark on shaft will be light on one side and heavy on the other) -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Stopped engine and drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Attached two worm type hose clamps 180 degrees from heavy spot on shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Moved clamps equal distance toward heavy spot and retested until vibration was eliminated -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Reinstalled brake drums, tire and wheel assemblies -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Lowered vehicle to floor -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Road tested -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to balance drive shaft -	_____	_____	2. Raised and supported vehicle -	_____	_____	3. Removed rear tire-and-wheel assemblies and brake drums (NOTE: Do not apply brakes with drums removed) -	_____	_____	4. Started engine and brought vehicle speed to vibration point -	_____	_____	5. Brought a crayon or colored pencil up to rear of rotating drive shaft -	_____	_____	6. Touched shaft with crayon; (NOTE: If shaft is unbalanced, mark on shaft will be light on one side and heavy on the other) -	_____	_____	7. Stopped engine and drive shaft -	_____	_____	8. Attached two worm type hose clamps 180 degrees from heavy spot on shaft -	_____	_____	9. Moved clamps equal distance toward heavy spot and retested until vibration was eliminated -	_____	_____	10. Reinstalled brake drums, tire and wheel assemblies -	_____	_____	11. Lowered vehicle to floor -	_____	_____	12. Road tested -	_____	_____
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11. Lowered vehicle to floor -	_____	_____																																						
12. Road tested -	_____	_____																																						

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a drive shaft is balanced according to manufacturer's specifications so the drive shaft does not vibrate at road speeds.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R	
		Task No. 11	
Task: Replace transmission mount using appropriate equipment to restore transmission mount operation.			
Achievement Indicators: The learner:		Yes	No
1. Raised and supported vehicle by frame -		_____	_____
2. Supported rear of motor or transmission with suitable jack -		_____	_____
3. Removed mount bolts and mounts (on some vehicles transmission must be raised to remove mounts) -		_____	_____
4. Placed new transmission mounts into position, aligned transmission and torqued to specifications) -		_____	_____
5. Removed support jacks and lowered vehicle to floor -		_____	_____
6. Started engine and checked mounts for looseness -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a transmission mount(s) is replaced according to manufacturer's specifications and the transmission is aligned and all hardware is torqued.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R																								
		Task No. 12																								
Task: Check drive line angles using appropriate equipment to detect any deviation in drive line angles.																										
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; width: 70%;">Achievement Indicators: The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> <tr> <td style="padding-top: 10px;">1. Referred to manufacturer's repair manual for correct procedure to check drive line angles -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">2. Checked curb height, adjusted if necessary -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">3. Raised and supported vehicle by axle or wheels -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">4. Cleaned all foreign substances from exposed surfaces of U-joint -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">5. Measured drive line angles and compared to specifications -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">6. Adjusted transmission mount, spring, or upper control arm to bring drive line angles to specifications -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> <tr> <td style="padding-top: 5px;">7. Lowered vehicle to floor -</td> <td style="text-align: center; vertical-align: bottom;">_____</td> <td style="text-align: center; vertical-align: bottom;">_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to check drive line angles -	_____	_____	2. Checked curb height, adjusted if necessary -	_____	_____	3. Raised and supported vehicle by axle or wheels -	_____	_____	4. Cleaned all foreign substances from exposed surfaces of U-joint -	_____	_____	5. Measured drive line angles and compared to specifications -	_____	_____	6. Adjusted transmission mount, spring, or upper control arm to bring drive line angles to specifications -	_____	_____	7. Lowered vehicle to floor -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the drive line angles are checked according to manufacturer's specifications to detect any deviation in drive line angles.																										
Tools and Equipment: Basic Tool Set Drive Line Angle Tool	Resources:																									

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R																																																									
	Task No. 13																																																									
Task: Replace integral differential assembly using appropriate equipment to restore integral differential assembly operation.																																																										
Achievement Indicators:	<table border="1"> <thead> <tr> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing integral differential assembly -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported vehicle by frame -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed rear wheels -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Supported rear axle assembly so tension was relieved from springs -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed trunion bearing, "U" bolts and split universal joint -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Disconnected rear suspension components from rear axle assembly (shock absorbers, tie rod, track bar, lower control arm, springs, etc.) -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Disconnected hydraulic brake hose at connector on axle housing -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Removed brake drum and disconnected parking brake cable at lever and flange plate -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Lowered differential assembly from vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Raised and located replacement differential assembly under vehicle -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Reconnected parking brake cable -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>12. Reconnected brake line -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>13. Connected rear suspension components and torqued all hardware -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>14. Reconnected universal joint "U" bolts to flange -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>15. Replaced rear wheels -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>16. Bled brakes and adjusted parking brake -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>17. Checked fluid levels in differential and adjusted -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>18. Lowered vehicle to floor -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing integral differential assembly -	_____	_____	2. Raised and supported vehicle by frame -	_____	_____	3. Removed rear wheels -	_____	_____	4. Supported rear axle assembly so tension was relieved from springs -	_____	_____	5. Removed trunion bearing, "U" bolts and split universal joint -	_____	_____	6. Disconnected rear suspension components from rear axle assembly (shock absorbers, tie rod, track bar, lower control arm, springs, etc.) -	_____	_____	7. Disconnected hydraulic brake hose at connector on axle housing -	_____	_____	8. Removed brake drum and disconnected parking brake cable at lever and flange plate -	_____	_____	9. Lowered differential assembly from vehicle -	_____	_____	10. Raised and located replacement differential assembly under vehicle -	_____	_____	11. Reconnected parking brake cable -	_____	_____	12. Reconnected brake line -	_____	_____	13. Connected rear suspension components and torqued all hardware -	_____	_____	14. Reconnected universal joint "U" bolts to flange -	_____	_____	15. Replaced rear wheels -	_____	_____	16. Bled brakes and adjusted parking brake -	_____	_____	17. Checked fluid levels in differential and adjusted -	_____	_____	18. Lowered vehicle to floor -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and the integral differential assembly is replaced according to manufacturer's specifications with the proper fluid level and all hardware torqued.

Tools and Equipment:
Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R																																													
Task: Replace removable differential assembly using appropriate equipment to restore removable differential assembly operation.																																														
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a removable differential assembly is replaced according to manufacturer's specifications.

Tools and Equipment:
Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R																																																
Task No. 18																																																	
Task: Rebuild trans-axle assembly using appropriate equipment to restore trans-axle assembly operation.																																																	
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 15%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for the correct procedure for rebuilding a trans-axle assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Removed trans-axle from vehicle -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Disassembled trans-axle case -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Disassembled input shaft assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Disassembled output shaft assembly -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Disassembled synchronizers -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Inspected all parts for damage, wear and alignment according to manufacturer's specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Reassembled synchronizers, output shaft and input shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Disassembled differential section -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Inspected all parts for damage, wear and alignment according to manufacturer's specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>11. Reassembled differential components and adjusted to specifications -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>12. Reassembled trans-axle case -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>13. Reinstalled trans-axle into vehicle -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>14. Checked all fluid levels and adjusted if necessary -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>15. Aligned front wheels if necessary -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>		Achievement Indicators:	Yes	No	1. Referred to manufacturer's repair manual for the correct procedure for rebuilding a trans-axle assembly -	_____	_____	2. Removed trans-axle from vehicle -	_____	_____	3. Disassembled trans-axle case -	_____	_____	4. Disassembled input shaft assembly -	_____	_____	5. Disassembled output shaft assembly -	_____	_____	6. Disassembled synchronizers -	_____	_____	7. Inspected all parts for damage, wear and alignment according to manufacturer's specifications -	_____	_____	8. Reassembled synchronizers, output shaft and input shaft -	_____	_____	9. Disassembled differential section -	_____	_____	10. Inspected all parts for damage, wear and alignment according to manufacturer's specifications -	_____	_____	11. Reassembled differential components and adjusted to specifications -	_____	_____	12. Reassembled trans-axle case -	_____	_____	13. Reinstalled trans-axle into vehicle -	_____	_____	14. Checked all fluid levels and adjusted if necessary -	_____	_____	15. Aligned front wheels if necessary -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a trans-axle assembly is rebuilt according to manufacturer's specifications with no fluid leaks, wheels aligned, and noise level at specifications.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)	Duty No. R		
Task No. 19			
Task: Replace front-drive axle assemblies using appropriate equipment to restore front-drive axle assemblies.			
Achievement Indicators:	The learner:		
	<table style="margin: auto;"> <tr> <th style="width: 100px;">Yes</th> <th style="width: 100px;">No</th> </tr> </table>	Yes	No
Yes	No		
1. Referred to manufacturer's repair manual for correct procedure to replace front-drive axle assemblies -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
2. Lifted vehicle and supported by frame -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
3. Drained differential lubricant -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
4. Removed front tires and wheels -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
5. Removed drive shaft with joint from differential -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
6. Removed lower ends of front shocks -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
7. Disconnected front brake line at flex line -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
8. Raised and supported differential assembly to relieve tension from springs -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
9. Disconnected steering and suspension components from assembly -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
10. Removed front-drive axle assemblies -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
11. Raised and located differential assembly -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
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13. Reconnected front brake line -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
14. Installed drive shaft -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
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15. Torqued all hardware to specifications -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
16. Bled brakes -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
17. Filled differential with proper lubricant -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
18. Adjusted toe-in -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		
19. Lowered vehicle to floor -	<table style="margin: auto;"> <tr> <td style="width: 100px;">_____</td> <td style="width: 100px;">_____</td> </tr> </table>	_____	_____
_____	_____		

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and front drive axle assemblies are replaced according to manufacturer's specifications with all hardware torqued and with no fluid leaks.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Manual Transmission, Front and Rear Axles (Drive Lines)		Duty No. R Task No. 20																																									
Task: Rebuild 4 wheel drive locking hubs using appropriate equipment to restore 4 wheel drive locking hubs.																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual on the proper procedure to rebuild locking hubs -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Raised and supported the vehicle from the frame -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed hub cover -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed snap rings spring and drive flange -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Cleaned and inspected all parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Replaced worn parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Lightly coated all parts with wheelbearing grease -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Reassembled locking hubs -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Performed operational test of hubs -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual on the proper procedure to rebuild locking hubs -		_____	_____	2. Raised and supported the vehicle from the frame -		_____	_____	3. Removed hub cover -		_____	_____	4. Removed snap rings spring and drive flange -		_____	_____	5. Cleaned and inspected all parts -		_____	_____	6. Replaced worn parts -		_____	_____	7. Lightly coated all parts with wheelbearing grease -		_____	_____	8. Reassembled locking hubs -		_____	_____	9. Performed operational test of hubs -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																								
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9. Performed operational test of hubs -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and 4 wheel drive locking hubs are rebuilt according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set		Resources:																																									

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5
		Task No. 1
Task: Test transmission in car using pressure to detect any pressure deviations.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for pressure testing transmission -	_____	_____
2. Installed pressure gauge to pressure port on transmission -	_____	_____
3. Installed vacuum gauge and tee to vacuum diaphragm control line if so equipped -	_____	_____
4. Started engine by following manufacturer's testing procedure -	_____	_____
5. Tested pressure by following manufacturer's testing procedure -	_____	_____
6. Compared readings to manufacturer's specifications -	_____	_____
7. Recorded any readings that deviated from specifications -	_____	_____
8. Stopped engine and removed gauges from transmission -	_____	_____
9. Checked fluid level and adjusted if necessary -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and transmission in car is tested using pressure according to manufacturer's specifications.		
Tools and Equipment: Pressure Gauges Basic Tool Set	Resources:	

Duty: Certification: Automatic Transmissions
(Automatic Transmissions)

Duty No. 5

Task No. 2

Task: Test transmission in car using stall procedures to detect any deviation in pressure readings at shift points and excessive slippage.

Achievement Indicators: The learner:

Yes No

1. Referred to manufacturer's repair manual for correct procedure for performing a stall test (NOTE: Some manufacturer's do not recommend performing a stall test) _____
2. Connected tachometer to engine and pressure gauges - _____
3. Checked transmission fluid and coolant levels; adjusted if necessary - _____
4. Started engine and warmed to normal operating temperature - _____
5. Blocked front wheels securely - _____
6. Applied parking and service brakes fully - _____
7. Shifted transmission into range being tested - _____
8. Accelerated to floor (NOTE: No more than 5 seconds) - _____
9. Recorded maximum rpm and pressure readings; compared with manufacturer's specifications - _____
10. Shifted into neutral with engine at 1,000 rpm's for 60 seconds - _____
11. Continued testing for other ranges; recorded all deviations in pressure and tachometer readings - _____
12. Disconnected tachometer and pressure gauges - _____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and transmission in car is tested using stall procedure according to manufacturer's specifications checking pressure readings and slippage.

Tools and Equipment:

Pressure Gauges
Tachometer
Basic Tool Set

Resources:

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5
		Task No. 3
Task: Clean transmission oil strainer using appropriate equipment to remove all foreign matter.		
Achievement Indicators: The learner		
	Yes	No
1. Referred to manufacturer's repair manual for procedure to clean transmission oil strainer -	_____	_____
2. Raised and supported vehicle -	_____	_____
3. Drained oil from transmission -	_____	_____
4. Removed oil pan -	_____	_____
5. Removed oil strainer -	_____	_____
6. Cleaned oil strainer with fresh solvent and brush -	_____	_____
7. Dried with compressed air (did not use a cloth) -	_____	_____
8. Installed oil strainer and new gaskets or seals -	_____	_____
9. Cleaned all gasket and sealing surfaces -	_____	_____
10. Installed transmission oil pan and new gaskets -	_____	_____
11. Torqued all cap screws to specifications -	_____	_____
12. Refilled transmission with proper fluid -	_____	_____
13. Checked for leaks -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and transmission oil strainer is cleaned according to manufacturer's specifications and so pan does not leak.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5																																				
		Task No. 4																																				
Task: Replace transmission filter using appropriate equipment to restore transmission filter operation.																																						
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11. Checked for leaks -	_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and transmission filter is replaced according to manufacturer's specifications and so the pan gasket does not leak.																																						
Tools and Equipment: Basic Tool Set	Resources:																																					

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5
		Task No. 5
Task: Adjust automatic transmission shift linkage using appropriate equipment to restore automatic transmission shift linkage operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to adjust shift linkage -		_____
2. Moved selector lever to drive -		_____
3. Raised and supported the car -		_____
4. Loosened shift rod or cable -		_____
5. Shifted manual valve lever to drive -		_____
6. Torqued adjusting nut or swivel lock bolt to specifications -		_____
7. Checked transmission operation for all selector positions -		_____
8. Checked and adjusted shift indicator -		_____
9. Checked accelerator linkage, downshift linkage or throttle valve linkage, cables or cable housing -		_____
10. Checked all electrical connections if applicable -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and shift linkage is adjusted according to manufacturer's specifications with the transmission locked in part and shift quadrant in park.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5
		Task No. 6
Task: Test vacuum shift modulator using appropriate equipment to detect any vacuum leak down deviations.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing vacuum shift modulator -	_____	_____
2. Checked engine for proper vacuum -	_____	_____
3. Raised and supported vehicle -	_____	_____
4. Disconnected vacuum line at modulator -	_____	_____
5. Applied 17 to 20 inches of vacuum to diaphragm -	_____	_____
6. Checked for vacuum leak down in 30 to 60 seconds -	_____	_____
7. Replaced defective modulator -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and vacuum shift modulator is tested according to manufacturer's specifications.		
Tools and Equipment: Vacuum Pump Vacuum Gauge Basic Tool Set	Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5	
		Task No. 7	
Task: Replace vacuum shift modulator using appropriate equipment to restore vacuum shift modulator operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace vacuum shift modulator -		_____	_____
2. Raised and supported vehicle -		_____	_____
3. Disconnected lines from modulator -		_____	_____
4. Removed modulator unit -		_____	_____
5. Removed control rod or valve from transmission case -		_____	_____
6. Cleaned all mounting surfaces -		_____	_____
7. Installed control rod or valve in transmission case -		_____	_____
8. Installed modulator unit -		_____	_____
9. Connected lines to modulator -		_____	_____
10. Checked fluid level -		_____	_____
11. Test drove vehicle -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and vacuum shift modulator is replaced according to manufacturer's specifications so there is no deviation from shift point specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5	
		Task No. 9	
Task: Replace transmission governor using appropriate equipment to restore transmission governor operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace transmission governor -		_____	_____
2. Raised and supported vehicle -		_____	_____
3. Removed rear extension housing or governor cover -		_____	_____
4. Removed governor assembly -		_____	_____
5. Inspected mounting surface for wear -		_____	_____
6. Installed new governor assembly -		_____	_____
7. Installed rear extension housing or governor cover -		_____	_____
8. Lowered vehicle to floor -		_____	_____
9. Checked fluid level and adjusted if necessary -		_____	_____
10. Checked governor operation -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and transmission governor is replaced according to manufacturer's specifications so all valves move freely in bore without binding.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. S																																													
		Task No. 10																																													
Task: Clean transmission governor using appropriate equipment to remove foreign material.																																															
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Tools and Equipment: Basic Tool Set	Resources:																																														

Duty: Certification: Automatic Transmission		Duty No. 5																																									
		Task No. 11																																									
Task: Clean transmission valve body using appropriate equipment to remove foreign material.																																											
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for procedure to clean valve body -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disassembled all parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Cleaned all parts in carburetor cleaner -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Rinsed all parts in hot running water -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Blew all parts dry with low-pressure filtered air -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Inspected valve body and its components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced all defective parts -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Lubricated all parts with A.T.F. -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Reassembled valve body -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to clean valve body -		_____	_____	2. Disassembled all parts -		_____	_____	3. Cleaned all parts in carburetor cleaner -		_____	_____	4. Rinsed all parts in hot running water -		_____	_____	5. Blew all parts dry with low-pressure filtered air -		_____	_____	6. Inspected valve body and its components -		_____	_____	7. Replaced all defective parts -		_____	_____	8. Lubricated all parts with A.T.F. -		_____	_____	9. Reassembled valve body -		_____	_____
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9. Reassembled valve body -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and a transmission valve body is cleaned according to manufacturer's specifications.																																											
Tools and Equipment: Basic Tool Set		Resources:																																									

Duty: Certification: Automatic Transmissions (Automatic Transmissions)	Duty No. S
	Task No. 12

Task: Replace automatic transmission with converter assembly using appropriate equipment to restore automatic transmission operation.

Achievement Indicators:	The learner:	Yes	No
1. Raised vehicle to gain access to transmission -		_____	_____
2. Referred to manufacturer's service manual for information to remove and replace transmission and converter assembly -		_____	_____
3. Drained transmission fluid -		_____	_____
4. Supported engine with jack -		_____	_____
5. Removed drive shaft -		_____	_____
6. Removed transmission mount and frame cross member -		_____	_____
7. Disconnected shift linkage, speedometer cable, filler tube, oil cooler lines and modular tubes and/or wires -		_____	_____
8. Removed converter to flywheel bolts -		_____	_____
9. Disconnected battery ground cable from battery -		_____	_____
10. Removed starter motor -		_____	_____
11. Removed transmission to engine bolts and removed transmission -		_____	_____
12. Reversed procedure for installation -		_____	_____
13. Road tested vehicle to ascertain proper transmission performance -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and the automatic transmission and converter assembly is replaced according to manufacturer's specifications and so that all hardware is torqued and cooling lines do not leak.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. S																																		
		Task No. 13																																		
Task: Replace automatic transmission without converter assembly using appropriate equipment to restore automatic transmission.																																				
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">Achievement Indicators:</td> <td style="width: 40%;">The learner:</td> <td style="width: 10%; text-align: center;">Yes</td> <td style="width: 10%; text-align: center;">No</td> </tr> </table> <table border="0" style="width: 100%;"> <tr> <td style="width: 70%;">1. Raised vehicle to gain access to transmission. -</td> <td style="width: 10%; text-align: center;">_____</td> <td style="width: 10%; text-align: center;">_____</td> </tr> <tr> <td>2. Located manufacturer's repair information for procedure to remove and replace transmission -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Drained transmission fluid -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Supported engine with jack -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Removed drive shaft -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Removed transmission mount and frame cross member -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Disconnected shift linkage, speedometer cable, filler tube, oil cooler lines, and modular tubes and/or wires -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Removed transmission-to-engine bolts and removed transmission with use of transmission jack -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Reversed procedure for installation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>10. Road tested vehicle for proper operation -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>			Achievement Indicators:	The learner:	Yes	No	1. Raised vehicle to gain access to transmission. -	_____	_____	2. Located manufacturer's repair information for procedure to remove and replace transmission -	_____	_____	3. Drained transmission fluid -	_____	_____	4. Supported engine with jack -	_____	_____	5. Removed drive shaft -	_____	_____	6. Removed transmission mount and frame cross member -	_____	_____	7. Disconnected shift linkage, speedometer cable, filler tube, oil cooler lines, and modular tubes and/or wires -	_____	_____	8. Removed transmission-to-engine bolts and removed transmission with use of transmission jack -	_____	_____	9. Reversed procedure for installation -	_____	_____	10. Road tested vehicle for proper operation -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and an automatic transmission without converter assembly is replaced according to manufacturer's specifications and all hardware is torqued and cooler lines do not leak.																																				
Tools and Equipment: Basic Tool Set	Resources: 1																																			

Duty: Certification: Automatic Transmissions (Automatic Transmissions)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">Duty No.</td> <td style="padding: 2px 5px;">S</td> </tr> <tr> <td style="padding: 2px 5px;">Task No.</td> <td style="padding: 2px 5px;">14</td> </tr> </table>	Duty No.	S	Task No.	14																																									
Duty No.	S																																													
Task No.	14																																													
Task: Rebuild automatic transmission assembly using appropriate equipment to restore automatic transmission operation.																																														
<table style="width: 100%;"> <tr> <th style="text-align: left; width: 75%;">Achievement Indicators: The learner:</th> <th style="width: 10%;">Yes</th> <th style="width: 15%;">No</th> </tr> <tr><td>1. Referred to manufacturer's overhaul procedure for automatic transmission -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>2. Cleaned outside of transmission and prepared for disassembly -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>3. Removed converter -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>4. Removed oil pan and valve body -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>5. Installed dial indicator and checked end play -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>6. Removed front oil pump, front band and front clutch assembly -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>7. Removed extension housing, governor and rear pump -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>8. Removed rear planetary unit and output shaft -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>9. Removed overrunning clutch and rear band assembly -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>10. Removed servo retainers and servo pistons -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>11. Cleaned all transmission parts; replaced defective components if necessary -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>12. Reassembled transmission, reversing procedure -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>13. Installed transmission -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> <tr><td>14. Road tested checking for proper operation -</td><td style="text-align: center;">_____</td><td style="text-align: center;">_____</td></tr> </table>		Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's overhaul procedure for automatic transmission -	_____	_____	2. Cleaned outside of transmission and prepared for disassembly -	_____	_____	3. Removed converter -	_____	_____	4. Removed oil pan and valve body -	_____	_____	5. Installed dial indicator and checked end play -	_____	_____	6. Removed front oil pump, front band and front clutch assembly -	_____	_____	7. Removed extension housing, governor and rear pump -	_____	_____	8. Removed rear planetary unit and output shaft -	_____	_____	9. Removed overrunning clutch and rear band assembly -	_____	_____	10. Removed servo retainers and servo pistons -	_____	_____	11. Cleaned all transmission parts; replaced defective components if necessary -	_____	_____	12. Reassembled transmission, reversing procedure -	_____	_____	13. Installed transmission -	_____	_____	14. Road tested checking for proper operation -	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and an automatic transmission is rebuilt according to manufacturer's specifications.

Tools and Equipment:

Advanced Tool Set

Resources:

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. S																																					
		Task No. 15																																					
Task: Test converter turbine end play using appropriate equipment to detect any deviation of converter turbine end play.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for specifications and procedure to test converter turbine end play -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Inserted manufacturer's holding tool into converter hub -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Locked holding tool in place -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Attached dial indicator and zero dial -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Raised tool upward -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Measured end play -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Compared with manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Replaced converter if readings exceeded specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for specifications and procedure to test converter turbine end play -		_____	_____	2. Inserted manufacturer's holding tool into converter hub -		_____	_____	3. Locked holding tool in place -		_____	_____	4. Attached dial indicator and zero dial -		_____	_____	5. Raised tool upward -		_____	_____	6. Measured end play -		_____	_____	7. Compared with manufacturer's specifications -		_____	_____	8. Replaced converter if readings exceeded specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																				
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8. Replaced converter if readings exceeded specifications -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to supervisor's directions and converter turbine end play is tested according to manufacturer's specifications.																																							
Tools and Equipment: Dial Indicator Manufacturer's Fixture		Resources:																																					

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5 Task No. 16																
Task: Air pressure test transmission on a bench using air pressure to detect any deviation of clutch application and leaks.																		
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and transmission is air pressure tested according to manufacturer's specifications to detect leaks and clutch application.																		
Tools and Equipment: Basic Tool Set		Resources:																

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5	
		Task No. 17	
Task: Flush converter assembly using pressure to remove all residue.			
Achievement Indicators:		The learner:	
		Yes	No
1. Referred to manufacturer's repair manual for correct procedure to flush converter assembly -		_____	_____
2. Followed instructions supplied by converter flushing machine to flush converter assembly -		_____	_____
3. Drained converter of fluid -		_____	_____
4. Mounted converter onto flushing machine -		_____	_____
5. Flushed converter system -		_____	_____
6. Disconnected converter from machine -		_____	_____
7. Dried converter with filtered air pressure -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a converter assembly is flushed according to manufacturer's specifications.			
Tools and Equipment: Converter Flushing Machine Basic Tool Set		Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5																																								
		Task No. 18																																								
Task: Flush automatic transmission cooler assembly using pressure to remove all residue.																																										
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 40%;">Achievement Indicators:</th> <th style="text-align: left; width: 40%;">The learner:</th> <th style="text-align: center; width: 10%;">Yes</th> <th style="text-align: center; width: 10%;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure to flush automatic transmission cooler assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Drained cooler assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Connected flushing hoses to cooler assembly -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Flushed cooler assembly until sight glass is clear -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Disconnected flushing lines -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Drained solvent from cooler -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Dried with filtered compressed air -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Reconnected transmission cooling lines -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>9. Checked for leaks -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to flush automatic transmission cooler assembly -		_____	_____	2. Drained cooler assembly -		_____	_____	3. Connected flushing hoses to cooler assembly -		_____	_____	4. Flushed cooler assembly until sight glass is clear -		_____	_____	5. Disconnected flushing lines -		_____	_____	6. Drained solvent from cooler -		_____	_____	7. Dried with filtered compressed air -		_____	_____	8. Reconnected transmission cooling lines -		_____	_____	9. Checked for leaks -		_____	_____
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9. Checked for leaks -		_____	_____																																							
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cooler assembly is flushed according to manufacturer's specifications and so sight glass is clear																																										
Tools and Equipment: Basic Tool Set Flushing Machine	Resources:																																									

Duty: Certification: Automatic Transmissions (Automatic Transmissions)	Duty No. 5	
	Task No. 19	
Task: Replace torque converter using appropriate equipment to restore torque converter operation.		
Achievement Indicators: The learner:	Yes	No
1. Referred to manufacturer's repair manual for proper procedure to replace torque converter -	_____	_____
2. Raised and supported vehicle -	_____	_____
3. Disconnected battery -	_____	_____
4. Drained oil from transmission -	_____	_____
5. Disconnected all component parts -	_____	_____
6. Removed propeller shaft -	_____	_____
7. Placed transmission jack under transmission -	_____	_____
8. Removed mounting bolts and raised transmission slightly -	_____	_____
9. Removed cross member -	_____	_____
10. Lowered transmission slightly -	_____	_____
11. Removed torque converter to flex plate bolts -	_____	_____
12. Removed bell housing bolts -	_____	_____
13. Moved transmission slightly to rear and lower -	_____	_____
14. Removed torque converter -	_____	_____
15. Installed new torque converter -	_____	_____
16. Reinstalled all components in reverse procedure -	_____	_____
17. Checked for proper operation -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a torque converter is replaced according to manufacturer's specifications.

Tools and Equipment:

Basic Tool Set

Resources:

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5
		Task No. 20
Task: Replace extension housing seal and bushing using appropriate equipment to restore extension housing seal and bushing.		
Achievement Indicators: The learner:		Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace extension housing seal and bushing -		_____
2. Raised and supported vehicle -		_____
3. Removed drive shaft (made sure position was marked) -		_____
4. Removed extension housing -		_____
5. Removed extension housing seal and bushing -		_____
6. Installed extension housing seal and bushing -		_____
7. Installed extension housing -		_____
8. Installed drive shaft -		_____
9. Checked for fluid leaks -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and extension seal and bushing are replaced according to manufacturer's specifications and so seal areas do not leak and drive shaft is in place.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Automatic Transmissions (Automatic Transmissions)		Duty No. 5																																									
		Task No. 21																																									
Task: Splice transmission cooler lines using appropriate equipment to restore transmission cooler line operation.																																											
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to splice transmission cooler lines -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Measured damaged length of tubing -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Cut new length of tubing with tubing cutter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Shaped the new tubing like the old -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed necessary fitting on lines -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Formed a double flare on each end of tubing -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed new line -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Tightened any mounting clamps -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Checked for leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to splice transmission cooler lines -		_____	_____	2. Measured damaged length of tubing -		_____	_____	3. Cut new length of tubing with tubing cutter -		_____	_____	4. Shaped the new tubing like the old -		_____	_____	5. Installed necessary fitting on lines -		_____	_____	6. Formed a double flare on each end of tubing -		_____	_____	7. Installed new line -		_____	_____	8. Tightened any mounting clamps -		_____	_____	9. Checked for leaks -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																								
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8. Tightened any mounting clamps -		_____	_____																																								
9. Checked for leaks -		_____	_____																																								
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and transmission cooler lines are spliced according to manufacturer's specifications and lines are properly routed and do not leak.																																											
Tools and Equipment: Basic Tool Set		Resources:																																									

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T	
		Task No. 1	
Task: Test control cables using appropriate equipment to detect any binding, disconnected, or out-of-adjustment cables.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing control cables -		_____	_____
2. Performance tested all controls -		_____	_____
3. Checked for sticking, loose working, or faulty operation of controls -		_____	_____
4. Visually inspected cables for loose connections, kinks or excessive wear -		_____	_____
5. Isolated and repaired or replaced defective controls -		_____	_____
6. Adjusted to proper specifications -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and control cables are tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T	
		Task No. 2	
Task: Test electrical control circuits using appropriate equipment to detect any deviations in resistance or voltage readings.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing electrical control circuits -		_____	_____
2. Checked resistance and voltage of all electrical components -		_____	_____
3. Compared with specifications -		_____	_____
4. Repaired or replaced any defective component -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and electrical control circuits are tested according to manufacturer's specifications.			
Tools and Equipment: Basic Tool Set Voltmeter Ohmmeter		Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 3
Task: Replace compressor belts using appropriate equipment to restore compressor belt operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing compressor belts -	_____	_____
2. Loosened cap screw controlling belt tension -	_____	_____
3. Loosened mounting bolts -	_____	_____
4. Removed belts -	_____	_____
5. Installed new belts -	_____	_____
6. Adjusted belt tension to specifications -	_____	_____
7. Tightened cap screw controlling belt tension -	_____	_____
8. Tightened mounting bolts with torque wrench -	_____	_____
9. Rechecked belt tension -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and compressor belts are replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																		
		Task No. 4																		
Task: Test vacuum components using appropriate equipment to detect any binding or vacuum leaks.																				
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Achievement Indicators: The learner:</td> <td style="width: 10%; text-align: center;">Yes</td> <td style="width: 20%; text-align: center;">No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing vacuum components -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Applied vacuum to component being tested -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Checked for any vacuum leaks and binding or sticking of linkage -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Checked all hoses and connections for vacuum leaks -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Repaired or replaced any leaking components -</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>			Achievement Indicators: The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing vacuum components -	_____	_____	2. Applied vacuum to component being tested -	_____	_____	3. Checked for any vacuum leaks and binding or sticking of linkage -	_____	_____	4. Checked all hoses and connections for vacuum leaks -	_____	_____	5. Repaired or replaced any leaking components -	_____	_____
Achievement Indicators: The learner:	Yes	No																		
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4. Checked all hoses and connections for vacuum leaks -	_____	_____																		
5. Repaired or replaced any leaking components -	_____	_____																		
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and vacuum components are tested according to manufacturer's specifications.																				
Tools and Equipment: Basic Tool Set Vacuum Pump	Resources:																			

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T														
		Task No. 5														
Task: Replace vacuum components using appropriate equipment to restore vacuum component operation.																
Achievement Indicators: The learner: 1. Referred to manufacturer's repair manual for correct procedure for replacing vacuum components - 2. Removed any hoses, electrical leads and linkage from defective component - 3. Removed defective component - 4. Installed replacement vacuum component - 5. Connected all hoses, electrical leads and linkage - 6. Checked operation of vacuum component -		<table> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> <tr><td>_____</td><td>_____</td></tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____															
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and vacuum component is replaced according to manufacturer's specifications.																
Tools and Equipment: Basic Tool Set	Resources:															

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																	
		Task No. 6																	
Task: Test air conditioning thermal switches using appropriate equipment to detect open or out-of-tolerance thermal switches.																			
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing air conditioning thermal switches -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Checked for open or out-of-tolerance thermal switches -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Replaced any defective or out-of-tolerance switch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing air conditioning thermal switches -		_____	_____	2. Checked for open or out-of-tolerance thermal switches -		_____	_____	3. Replaced any defective or out-of-tolerance switch -		_____	_____
Achievement Indicators:	The learner:	Yes	No																
1. Referred to manufacturer's repair manual for correct procedure for testing air conditioning thermal switches -		_____	_____																
2. Checked for open or out-of-tolerance thermal switches -		_____	_____																
3. Replaced any defective or out-of-tolerance switch -		_____	_____																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and thermal switch is tested according to manufacturer's specifications to detect open or out-of-tolerance thermal switches.																			
Tools and Equipment: Basic Tool Set Ohmmeter		Resources:																	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																	
		Task No. 7																																	
Task: Test blower motor using appropriate equipment to detect excessive current draw.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected ampmeter in series with motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Started electric motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Measured amperage draw -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Measured RPM with tachometer -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Compared readings to manufacturer's specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced or repaired defective blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing blower motor -		_____	_____	2. Connected ampmeter in series with motor -		_____	_____	3. Started electric motor -		_____	_____	4. Measured amperage draw -		_____	_____	5. Measured RPM with tachometer -		_____	_____	6. Compared readings to manufacturer's specifications -		_____	_____	7. Replaced or repaired defective blower motor -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and blower motor is tested according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set Ampmeter Tachometer		Resources:																																	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																					
		Task No. 8																																					
Task: Replace blower motor using appropriate equipment to restore blower motor operation.																																							
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads from motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed any components necessary to gain access to blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Reinstalled any component removed to gain access to blower motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reconnected any electrical leads to motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked operation of electrical motor -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing blower motor -		_____	_____	2. Disconnected electrical leads from motor -		_____	_____	3. Removed any components necessary to gain access to blower motor -		_____	_____	4. Removed blower motor -		_____	_____	5. Installed replacement blower motor -		_____	_____	6. Reinstalled any component removed to gain access to blower motor -		_____	_____	7. Reconnected any electrical leads to motor -		_____	_____	8. Checked operation of electrical motor -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and blower motor is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																																
		Task No. 9																																																
Task: Test thermostatic clutch switch using appropriate equipment to detect any deviation from specified operating temperature.																																																		
<table border="1"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Referred to manufacturer's repair manual for correct procedure for testing thermostatic clutch switch -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2.</td> <td>Connected the manifold and gauge set into the system -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3.</td> <td>Started engine and set RPM to 1200-1500 -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4.</td> <td>Set controls for max cooling -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5.</td> <td>Inserted thermometer into the evaporator -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6.</td> <td>Set thermostat to the full on position -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7.</td> <td>Observed the manifold gauge -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8.</td> <td>Compared low pressure readings with evaporator core thermometer readings against a temperature-pressure chart -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9.</td> <td>Checked points that thermostat cuts in and out -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10.</td> <td>Compared with specifications -</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11.</td> <td>Adjusted or replaced switch that does not meet specifications -</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1.	Referred to manufacturer's repair manual for correct procedure for testing thermostatic clutch switch -	_____	_____	2.	Connected the manifold and gauge set into the system -	_____	_____	3.	Started engine and set RPM to 1200-1500 -	_____	_____	4.	Set controls for max cooling -	_____	_____	5.	Inserted thermometer into the evaporator -	_____	_____	6.	Set thermostat to the full on position -	_____	_____	7.	Observed the manifold gauge -	_____	_____	8.	Compared low pressure readings with evaporator core thermometer readings against a temperature-pressure chart -	_____	_____	9.	Checked points that thermostat cuts in and out -	_____	_____	10.	Compared with specifications -	_____	_____	11.	Adjusted or replaced switch that does not meet specifications -	_____	_____
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10.	Compared with specifications -	_____	_____																																															
11.	Adjusted or replaced switch that does not meet specifications -	_____	_____																																															
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and thermostatic clutch switch is tested according to manufacturer's specifications.																																																		
Tools and Equipment: Basic Tool Set Manifold & Gauge Set Thermometer		Resources:																																																

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 10
Task: Replace thermostatic clutch switch using appropriate equipment to restore thermostatic clutch switch operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing thermostatic clutch switch -	_____	_____
2. Removed all components necessary to gain access to switch -	_____	_____
3. Disconnected electrical leads -	_____	_____
4. Removed the switch (remove capillary tube) -	_____	_____
5. Installed replacement switch (route and install capillary tube) -	_____	_____
6. Connected electrical leads -	_____	_____
7. Installed all components removed to gain access to switch -	_____	_____
8. Checked operation of switch -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and thermostatic switch is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditiong (Heating and Air Conditioning)		Duty No. T																																																	
		Task No. 11																																																	
Task: Test air conditioning magnetic clutch switch using appropriate equipment to detect any slipping, overheating or bearing noise.																																																			
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing magnetic clutch switch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Connected manifold and gauge set into system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Started engine and set RPM to 1200-1500 -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Set controls for max cooling -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Inserted thermometer into evaporator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Set thermostat to full on position -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Observe manifold gauge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Compared low pressure readings with evaporator core thermometer readings against temperature-pressure chart -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Checked points that thermostat cuts in and out -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Compared with specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>11. Adjusted or replaced switch if it does not meet specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing magnetic clutch switch -		_____	_____	2. Connected manifold and gauge set into system -		_____	_____	3. Started engine and set RPM to 1200-1500 -		_____	_____	4. Set controls for max cooling -		_____	_____	5. Inserted thermometer into evaporator -		_____	_____	6. Set thermostat to full on position -		_____	_____	7. Observe manifold gauge -		_____	_____	8. Compared low pressure readings with evaporator core thermometer readings against temperature-pressure chart -		_____	_____	9. Checked points that thermostat cuts in and out -		_____	_____	10. Compared with specifications -		_____	_____	11. Adjusted or replaced switch if it does not meet specifications -		_____	_____
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11. Adjusted or replaced switch if it does not meet specifications -		_____	_____																																																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and clutch switch is tested according to manufacturer's specifications.																																																			
Tools and Equipment: Basic Tool Set		Resources:																																																	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T Task No. 12																																					
Task: Replaced air conditioning magnetic clutch using appropriate equipment to restore air conditioning magnetic clutch switch operation.																																							
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing air conditioning magnetic clutch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Removed all components necessary to gain access to switch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Disconnected electrical leads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed switch (removed capillary tube) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Installed replacement switch (routed and installed capillary tube) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Connected electrical leads -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Installed all components removed to gain access to switch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Checked operation of switch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing air conditioning magnetic clutch -		_____	_____	2. Removed all components necessary to gain access to switch -		_____	_____	3. Disconnected electrical leads -		_____	_____	4. Removed switch (removed capillary tube) -		_____	_____	5. Installed replacement switch (routed and installed capillary tube) -		_____	_____	6. Connected electrical leads -		_____	_____	7. Installed all components removed to gain access to switch -		_____	_____	8. Checked operation of switch -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																				
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7. Installed all components removed to gain access to switch -		_____	_____																																				
8. Checked operation of switch -		_____	_____																																				
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and magnetic clutch switch is replaced according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T Task No. 13	
Task: Test clutch and pulley assembly using appropriate equipment to detect any slipping, overheating, or bearing noise.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing clutch and pulley assembly - 2. Disconnected field coil wire from clutch - 3. Connected ampmeter in series with coil - 4. Measured amperage draw - 5. Compared to specifications - 6. Started engine and set air conditioner to max cool - 7. Cycled clutch and checked for slipping, overheating and bearing noise - 8. Repaired or replaced all worn or defective components -		_____ _____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____ _____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and pulley assembly and clutch are tested according to manufacturer's specifications to detect slipping, overheating or bearing noise.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 14
Task: Replace clutch and hub assembly (rotary type) using appropriate equipment to restore clutch and hub assembly operation.		
Achievement Indicators: The learner:		Yes No
1. Referred to manufacturer's repair manual for correct procedure for replacing clutch and hub assembly -		_____
2. Loosened and removed belts from compressor -		_____
3. Removed cap screw from center of compressor crankshaft -		_____
4. Removed clutch and hub assembly -		_____
5. Installed new clutch and hub assembly -		_____
6. Torqued cap screw located on center of compressor crankshaft -		_____
7. Reinstalled and tightened belts from compressor -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and clutch and hub assembly are replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty:	Certification: Heating and Air Conditioning (Heating and Air Conditioning)	Duty No.	T
		Task No.	15
Task: Replace compressor seals using appropriate equipment to restore compressor seal operation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing compressor seals -		_____	_____
2. Installed manifold gage set -		_____	_____
3. Released refrigerant charge slowly -		_____	_____
4. In accordance with manufacturer's specifications, removed the following:			
a. Clutch lock nut -		_____	_____
b. Clutch drive plate -		_____	_____
c. Seal seat retainer ring -		_____	_____
d. Seal seat -		_____	_____
e. Shaft seal -		_____	_____
f. "O" ring -		_____	_____
5. To reinstall, was certain compressor neck was clean and reversed above procedure -		_____	_____
6. Referred to manufacturer's service manual to obtain compressor overhaul procedures and specifications -		_____	_____
7. Following procedure, disassembled and inspected all compressor parts to locate malfunction -		_____	_____
8. Replaced parts as needed and assembled following service procedures -		_____	_____
9. Leak tested compressor using appropriate adaptor -		_____	_____
10. Returned compressor to service -		_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and compressor seals are replaced according to manufacturer's specifications and so all seals and connections do not leak.

Tools and Equipment:
Advanced Tool Set

Resources:

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																	
		Task No. 16																																	
Task: Test air conditioner charge using appropriate equipment to detect a high-low ratio.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for testing air conditioner charge -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Referred to manufacturer's service manual to obtain pressure specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Connected manifold gauge set -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Purged air from service lines and positioned service valves (to cracked position) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Ran engine at fast idle and air conditioning unit on; allowed at least 5 minutes for unit to stabilize -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Recorded pressure readings and ambient temperatures -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Compared readings to specifications to determine if unit is functioning properly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for testing air conditioner charge -		_____	_____	2. Referred to manufacturer's service manual to obtain pressure specifications -		_____	_____	3. Connected manifold gauge set -		_____	_____	4. Purged air from service lines and positioned service valves (to cracked position) -		_____	_____	5. Ran engine at fast idle and air conditioning unit on; allowed at least 5 minutes for unit to stabilize -		_____	_____	6. Recorded pressure readings and ambient temperatures -		_____	_____	7. Compared readings to specifications to determine if unit is functioning properly -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and air conditioning charge is tested according to manufacturer's specifications.																																			
Tools and Equipment: Basic Tool Set Manifold & Gauge Set		Resources:																																	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)	Duty No. T
	Task No. 17

Task: Charge system using one pound cans to restore high-low ratio.

Achievement Indicators:	The learner:	Yes	No
1.	Referred to manufacturer's repair manual for correct procedure for charging system using one pound cans -	_____	_____
2.	Referred to manufacturer's service manual to outline air conditioning system evacuation procedures -	_____	_____
3.	Closed manifold gauge, set hand valve -	_____	_____
4.	Wore eye safety goggles as recommended for handling chemicals -	_____	_____
5.	Removed service valve caps and installed appropriate manifold gage set -	_____	_____
6.	Positioned hand-operated type service valves to mid (cracked) position -	_____	_____
7.	Purged system of all refrigerant if gages indicate pressure by opening low side manifold valve to center hose -	_____	_____
8.	Connected vacuum pump to center hose and allowed to work a minimum of one-half ($\frac{1}{2}$) hour -	_____	_____
9.	Closed manifold hand valves, turned off and disconnected vacuum pump, and observed low side gage for leaks -	_____	_____
10.	Connected center manifold hose to can tap port -	_____	_____
11.	Purged line of air -	_____	_____
12.	Started engine, adjusted speed to 1250 RPM -	_____	_____
13.	Adjusted controls for maximum cooling with blower on high speed -	_____	_____
14.	Opened low-side gauge manifold hand valve to allow gaseous refrigerant to enter system -	_____	_____
15.	Inverted refrigerant can when pressure on low side drops below 40 psig -	_____	_____
16.	Repeated procedure with additional cans of refrigerant as required to charge system completely -	_____	_____
17.	Closed low side manifold hand valve -	_____	_____
18.	Removed can tap from center hose -	_____	_____

The learner:

Yes

No

19. Conducted performance test - _____
20. Backed seat compressor service valves - _____
21. Removed manifold and gauge set - _____
22. Replaced all protective caps and covers - _____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and system is charged according to manufacturer's specifications using one pound cans to restore high-low ratio.

Tools and Equipment:

Advanced Tool Set
Manifold Gauge Set

Resources:

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)	Duty No. T
	Task No. 18

Task: Charge system using bulk charge to restore high-low ratio.

Achievement Indicators:	The learner:	Yes	No
1.	Referred to manufacturer's repair manual for correct procedure to charge system using bulk charge -	_____	_____
2.	Referred to manufacturer's service manual to outline air conditioning system evacuation procedures -	_____	_____
3.	Closed manifold gage, set hand valve -	_____	_____
4.	Wore eye safety goggles as recommended for handling chemicals -	_____	_____
5.	Removed service valve caps and installed appropriate manifold gage set -	_____	_____
6.	Positioned hand-operated type service valves to mid (cracked) position -	_____	_____
7.	Purged system of all refrigerant if gages indicate pressure by opening low side manifold valve to center hose -	_____	_____
8.	Connected vacuum pump to center hose and allow to work a minimum of one-half ($\frac{1}{2}$) hour -	_____	_____
9.	Closed manifold hand valves, turned off and disconnected vacuum pump and observed low side gage for leaks -	_____	_____
10.	Connected center manifold gauge hose to refrigerant cylinder adapter -	_____	_____
11.	Purged line of air -	_____	_____
12.	Started engine, adjusted speed to 1250 RPM -	_____	_____
13.	Adjusted controls for maximum cooling with blower on high speed -	_____	_____
14.	Opened low-side gauge manifold hand valve to allow gaseous refrigerant to enter system -	_____	_____
15.	Placed bulk cylinder on scale to insure refrigerant is properly measured -	_____	_____
16.	Closed low-side manifold hand valve when system is fully charged -	_____	_____
17.	Closed cylinder service valve and removed center hose -	_____	_____

The learner:

Yes

No

18. Conducted performance test - _____
19. Backed seat compressor service valves - _____
20. Removed manifold and gauge set - _____
21. Replaced all protective caps and covers - _____

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and system is charged according to manufacturer's specifications using bulk charge to restore high-low ratio.

Tools and Equipment:

Advanced Tool Set
Manifold Gauge Set
Scale

Resources:

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)	Duty No. T
	Task No. 19

Task: Perform leak test using electronic tester to detect all freon leaks.

Achievement Indicators: The learner:

Yes No

- | | | |
|--|-------|-------|
| 1. Referred to manufacturer's repair manual for correct procedure to perform leak test using electronic tester - | _____ | _____ |
| 2. Connected manifold and gauge set to system - | _____ | _____ |
| 3. Placed high- and low-side compressor service valves in cracked position - | _____ | _____ |
| 4. Placed high- and low-side manifold hand valves in cracked position - | _____ | _____ |
| 5. Determined presence of refrigerant in system (NOTE: A minimum of 50 psi is needed for leak detection) - | _____ | _____ |
| 6. Added refrigerant if below 50 psi - | _____ | _____ |
| 7. Prepared leak detector according to manufacturer's directions - | _____ | _____ |
| 8. Moved search hose under all joints and connections - | _____ | _____ |
| 9. Disconnected any vacuum hoses connected to system - | _____ | _____ |
| 10. Checked vacuum ports for leakage - | _____ | _____ |
| 11. Checked all seals and control devices - | _____ | _____ |
| 12. Checked condenser and evaporation - | _____ | _____ |
| 13. Repaired all leaks and recharged - | _____ | _____ |

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and a leak test is performed according to manufacturer's specifications using electronic tester to detect all freon leaks.

Tools and Equipment:

Advanced Tool Set
Electronic Leak
Detector

Resources:

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 20
Task: Replace refrigerant lines using appropriate equipment to restore refrigerant lines operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace refrigerant lines -		_____
2. Purged system of refrigerant -		_____
3. Removed defective line -		_____
4. Evacuated the sytem -		_____
5. Charged system -		_____
6. Checked for leaks -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and refrigerant lines are replaced according to manufacturer's specifications and so connections do not leak and lines are properly routed.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 21
Task: Fabricate refrigerant lines using appropriate equipment to restore refrigerant line operation.		
Achievement Indicators:	The learner:	
	Yes No	
1. Referred to manufacturer's repair manual for correct procedure to fabricate refrigerant lines - 2. Located and marked proper length and location of hose - 3. Cut hose with a razor blade - 4. Applied clean refrigeration oil to inside of new hose - 5. Insured that fittings are free of nicks and burrs - 6. Coated fittings liberally with clean refrigeration oil - 7. Slipped insert fitting inside new hose - 8. Installed hose clamp and tightened to 30 ft. lbs. - 9. Returned hose to service -	_____	

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and refrigerant lines are fabricated according to manufacturer's specifications and so connections do not leak and hose stock is equivalent to original equipment.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 22
Task: Test compressor oil level using appropriate equipment to detect deviations in oil level.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing compressor oil level -	_____	_____
2. Checked or measured oil level -	_____	_____
3. Adjusted oil level -	_____	_____
4. Returned compressor to service -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been completed according to the supervisor's directions and compressor oil level is tested according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 23
Task: Test dryer using appropriate equipment to detect any oil leaks in barrel icing or excessive barrel temperature differential.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing dryer -	_____	_____
2. Connected manifold gauge set -	_____	_____
3. Started engine and set speed to 1250 RPM -	_____	_____
4. Adjusted controls to maximum cool with blower on high -	_____	_____
5. Checked sight glass for constant presence of small bubbles -	_____	_____
6. Checked gauge pressures and compared to specifications -	_____	_____
7. Checked inlet line temperature and outlet line temperature -	_____	_____
8. Replaced dryer if temperature differs -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and dryer is tested according to manufacturer's specifications.		
Tools and Equipment: Advanced Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 24
Task: Replace dryer in air conditioning unit using appropriate equipment to restore dryer operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing dryer -	_____	_____
2. Installed manifold gage set -	_____	_____
3. Released refrigerant charge slowly -	_____	_____
4. Disconnected POA valve from suction tube -	_____	_____
5. Disconnected high and low pressure coolant lines -	_____	_____
6. Moved condenser to allow access to dryer -	_____	_____
7. Replaced dryer -	_____	_____
8. Reconnected system in reverse order -	_____	_____
9. Evacuated system -	_____	_____
10. Charged system -	_____	_____
11. Performed operational check -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and dryer is replaced according to manufacturer's specifications and so freon does not leak.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 25
Task: Replace condenser in air conditioning unit using appropriate equipment to restore condenser operation.		
Achievement Indicators: The learner:		Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace condenser -		_____
2. Installed manifold gage set -		_____
3. Released refrigerant charge slowly -		_____
4. Removed receiver dryer if attached -		_____
5. Removed condenser bolts and condenser from auto -		_____
6. Reversed procedure to reinstall -		_____
7. Evacuated system -		_____
8. Charged system -		_____
9. Performed operational check -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and condenser is replaced according to manufacturer's specifications and so freon does not leak.		
Tools and Equipment: Basic Tool Set	Resources: 541	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 26
Task: Replace evaporator using appropriate equipment to restore evaporator operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for replacing evaporator -	_____	_____
2. Installed manifold gage set -	_____	_____
3. Released refrigerant charge slowly -	_____	_____
4. Removed refrigerant lines and front half of refrigerant manifold -	_____	_____
5. Removed manifold mounting studs and evaporator assembly -	_____	_____
6. With assembly out, disassembled evaporator case and removed evaporator core -	_____	_____
7. Replaced evaporator core and reassembled in reverse order -	_____	_____
8. Evacuated system -	_____	_____
9. Charged system -	_____	_____
10. Performed operational check -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and evaporator is replaced according to manufacturer's specifications and so freon does not leak.		
Tools and Equipment: Basic Tool Set	Resources:	
542		

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																				
		Task No. 27																																				
Task: Replace heater core using appropriate equipment to restore heater core operation.																																						
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure to replace heater core -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Drained radiator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed heater hoses at heater -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed cable and electrical connectors from heater -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. On engine side of dash, removed retaining fasteners holding heater assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Inside vehicle, pulled entire heating assembly out of dash -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Removed heater core fasteners and removed core -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Replaced core reversing above procedure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure to replace heater core -		_____	_____	2. Drained radiator -		_____	_____	3. Removed heater hoses at heater -		_____	_____	4. Removed cable and electrical connectors from heater -		_____	_____	5. On engine side of dash, removed retaining fasteners holding heater assembly -		_____	_____	6. Inside vehicle, pulled entire heating assembly out of dash -		_____	_____	7. Removed heater core fasteners and removed core -		_____	_____	8. Replaced core reversing above procedure -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and heater core is replaced according to manufacturer's specifications and so coolant does not leak.																																						
Tools and Equipment: Basic Tool Set	Resources: 543																																					

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																													
		Task No. 28																																													
Task: Replace measured orifice valve (expansion valve) using appropriate equipment to restore measured orifice valve operation.																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing measured orifice valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Installed manifold gage set -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Released refrigerant charge slowly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Disconnected equalizer line and expansion valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Pulled out sensing tube carefully from suction line well -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Removed rubber seal from sensing tube -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced expansion valve and reassembled using reverse order -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Evacuated system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Charged system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Performed operational check -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing measured orifice valve -		_____	_____	2. Installed manifold gage set -		_____	_____	3. Released refrigerant charge slowly -		_____	_____	4. Disconnected equalizer line and expansion valve -		_____	_____	5. Pulled out sensing tube carefully from suction line well -		_____	_____	6. Removed rubber seal from sensing tube -		_____	_____	7. Replaced expansion valve and reassembled using reverse order -		_____	_____	8. Evacuated system -		_____	_____	9. Charged system -		_____	_____	10. Performed operational check -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																												
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9. Charged system -		_____	_____																																												
10. Performed operational check -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and expansion valve is replaced according to manufacturer's specifications and so unit does not leak freon or oil.																																															
Tools and Equipment: Basic Tool Set		Resources:																																													

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T	
		Task No. 29	
Task: Test throttle suctioning valve using appropriate equipment to detect any deviation.			
Achievement Indicators: The learner:		Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing throttle suctioning valve -		_____	_____
2. Attached manifold gauge set to system -		_____	_____
3. Started engine and adjusted speed to 1000-1200 RPM -		_____	_____
4. Adjusted controls for maximum cooling -		_____	_____
5. Moved temperature control back and forth 10 to 15 times to normalize the diaphragm -		_____	_____
6. Noted gauge readings should be between 29-31 psi -		_____	_____
7. Adjusted or replaced valve if readings of 29-31 psi are not reached -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and throttle suctioning valve is tested according to manufacturer's specifications.			
Tools and Equipment: Advanced Tool Set Manifold Gauge Set		Resources: 545	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T																																													
		Task No. 30																																													
Task: Replace throttle suctioning valve using appropriate equipment to restore throttle-suctioning valve operation.																																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for correct procedure for replacing throttle suctioning valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Installed manifold gage set -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Released refrigerant charge slowly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Removed evaporator pressure regulator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Repaired or replaced malfunctioning diaphragm or unit itself -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Reinstalled evaporator pressure regulator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Made necessary adjustments -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Evacuated system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>9. Recharged system -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>10. Performed operational test -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for correct procedure for replacing throttle suctioning valve -		_____	_____	2. Installed manifold gage set -		_____	_____	3. Released refrigerant charge slowly -		_____	_____	4. Removed evaporator pressure regulator -		_____	_____	5. Repaired or replaced malfunctioning diaphragm or unit itself -		_____	_____	6. Reinstalled evaporator pressure regulator -		_____	_____	7. Made necessary adjustments -		_____	_____	8. Evacuated system -		_____	_____	9. Recharged system -		_____	_____	10. Performed operational test -		_____	_____
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9. Recharged system -		_____	_____																																												
10. Performed operational test -		_____	_____																																												
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and throttle suctioning valve is replaced according to manufacturer's specifications and so connections do not leak.																																															
Tools and Equipment: Advanced Tool Set		Resources:																																													

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 31
Task: Test compressor reed plates using appropriate equipment to detect any external leakage.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure for testing compressor reed plates -	_____	_____
2. Isolated compressor -	_____	_____
3. Sealed compressor inlet fitting -	_____	_____
4. Connected high side gauge to high side compressor service valve -	_____	_____
5. Started engine and adjusted speed to 500 RPM -	_____	_____
6. Engaged clutch and operated compressor for no more than 15 seconds -	_____	_____
7. Turned off compressor -	_____	_____
8. Read high side gauge (NOTE: Reading should be 180-200 psi) -	_____	_____
9. Replaced faulty reed valve or plate if pressure is lower -	_____	_____
10. Restored compressor to service -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and compressor reed plates are tested according to manufacturer's specifications.		
Tools and Equipment: Advanced Tool Set Manifold Gauge Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 32
Task: Replace compressor reed plates using appropriate equipment to restore compressor reed plate operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for correct procedure to replace compressor reed plates -	_____	_____
2. Isolated compressor from system -	_____	_____
3. Unfastened and removed service valves with hoses attached -	_____	_____
4. Removed compressor head bolts -	_____	_____
5. Removed valve plate and head from compressor body -	_____	_____
6. Cleaned old gasket material from components -	_____	_____
7. Coated all new gaskets with refrigerant oil -	_____	_____
8. Installed new reed plate -	_____	_____
9. Installed head and gasket -	_____	_____
10. Torqued all head bolts to specifications -	_____	_____
11. Reinstalled service valves and hoses -	_____	_____
12. Evacuated and recharged system -	_____	_____
13. Performance tested sytem -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and reed plates are replaced according to manufacturer's specifications without internal vacuum or external freon leaks.		
Tools and Equipment: Advanced Tool Set Manifold & Gauge Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T
		Task No. 33
Task: Replace compressor using appropriate equipment to restore compressor operation.		
Achievement Indicators:	The learner:	Yes No
1. Referred to manufacturer's repair manual for correct procedure to replace compressor -		_____
2. Purged system of refrigerant (or isolate compressor) -		_____
3. Removed inlet and outlet valves or hoses -		_____
4. Removed belts -		_____
5. Removed clutch lead wire -		_____
6. Removed mounting bolts and brackets -		_____
7. Removed compressor -		_____
8. Transferred clutch and mounting brackets to replacement -		_____
9. Checked replacement compressor oil level -		_____
10. Reversed above procedure for installation -		_____
11. Evacuated system -		_____
12. Charged system -		_____
13. Performance tested system -		_____
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and compressor is replaced according to manufacturer's specifications and so connections do not leak, lines properly routed, belts aligned and tensioned and mounting hardware is torqued.		
Tools and Equipment: Advanced Tool Set Manifold & Gauge Set	Resources:	

Duty: Certification: Heating and Air Conditioning
(Heating and Air Conditioning)

Duty No. T

Task No. 34

Task: Rebuild rotary compressor (swash-plate) using appropriate equipment to restore rotary compressor operation.

Achievement Indicators: The learner:

Yes

No

1. Referred to manufacturer's repair manual for correct procedure to rebuild rotary compressor -
2. Removed hub and drive plate -
3. Removed pulley and bearing -
4. Removed housing assembly -
5. Removed shaft seal assembly -
6. Removed rear head, oil pump and valve plate -
7. Removed internal assembly -
8. Replaced or rebuilt internal assembly -
9. Examined all internal valves, seals, screens, seats and other parts for wear or damage -
10. Coated all parts with clean refrigerant oil -
11. Installed internal assembly -
12. Installed rear head assembly -
13. Installed seal assembly -
14. Leak tested compressor -
15. Installed coil housing -
16. Installed bearing and pulley assembly -
17. Installed hub and drive plate -
18. Refilled compressor with clean refrigerant oil -
19. Returned compressor to service -

Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and rotary compressor is rebuilt according to manufacturer's specifications.	
Tools and Equipment: Advanced Tool Set	Resources:

Duty: Certification: Heating and Air Conditioning (Heating and Air Conditioning)		Duty No. T														
		Task No. 35														
Task: Install air conditioning system using appropriate equipment to provide air conditioner service.																
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> </tr> </tbody> </table>	Yes	No	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
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_____	_____															
_____	_____															
_____	_____															
_____	_____															
<table border="1"> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for the correct procedure for installing air conditioning system -</td> <td></td> </tr> <tr> <td>2. Obtained kit for air conditioning system and checked for all parts needed for proper installation -</td> <td></td> </tr> <tr> <td>3. Installed compressor, condenser, dryer, thermostatic expansion valve, evaporator assembly, switches, hoses and electrical wiring -</td> <td></td> </tr> <tr> <td>4. Checked all components for looseness, engine clearance and proper positioning -</td> <td></td> </tr> <tr> <td>5. Charged system with refrigerant according to manufacturer's specifications -</td> <td></td> </tr> <tr> <td>6. Performed operational test for proper functioning -</td> <td></td> </tr> </tbody> </table>			1. Referred to manufacturer's repair manual for the correct procedure for installing air conditioning system -		2. Obtained kit for air conditioning system and checked for all parts needed for proper installation -		3. Installed compressor, condenser, dryer, thermostatic expansion valve, evaporator assembly, switches, hoses and electrical wiring -		4. Checked all components for looseness, engine clearance and proper positioning -		5. Charged system with refrigerant according to manufacturer's specifications -		6. Performed operational test for proper functioning -			
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5. Charged system with refrigerant according to manufacturer's specifications -																
6. Performed operational test for proper functioning -																
Criteria: Competence in this task will be recognized when the achievement indicators have been performed according to the supervisor's directions and air conditioning system is installed according to manufacturer's specifications.																
Tools and Equipment: Advanced Tool Set	Resources:															

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U	
		Task No. 1	
Task: Test coolant/anti-freeze using appropriate equipment to determine freezing point.			
Achievement Indicators: The learner:		Yes	No
1. Referred to coolant tester manufacturer's procedure for testing coolant protection levels -		_____	_____
2. Removed radiator cap -		_____	_____
3. Determined freezing point of coolant -		_____	_____
4. Checked the condition of the coolant -		_____	_____
5. Installed the radiator cap -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and coolant/anti-freeze is tested according to manufacturer's specifications.			
Tools and Equipment: Coolant Tester		Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																																					
		Task No. 2																																					
Task: Install coolant/anti-freeze using appropriate equipment to protect cooling system and engine for local temperature conditions.																																							
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's specifications manual for coolant capacity -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Drained the radiator and block of coolant -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Closed all petcocks and drains -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Added the required amount of coolant -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Checked the circulation of the coolant -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Adjusted the coolant level -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Checked for leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>8. Rechecked coolant protection level -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's specifications manual for coolant capacity -		_____	_____	2. Drained the radiator and block of coolant -		_____	_____	3. Closed all petcocks and drains -		_____	_____	4. Added the required amount of coolant -		_____	_____	5. Checked the circulation of the coolant -		_____	_____	6. Adjusted the coolant level -		_____	_____	7. Checked for leaks -		_____	_____	8. Rechecked coolant protection level -		_____	_____
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8. Rechecked coolant protection level -		_____	_____																																				
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Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U	
		Task No. 3	
Task: Inspect water hoses using appropriate equipment to detect cracked, soft, or worn hoses.			
Achievement Indicators: The learner:		Yes	No
1. Visually inspected hoses for cracks, leaks, being soft or worn -		_____	_____
2. Replaced any defective hoses -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and water hoses are inspected according to manufacturer's specifications.			
Tools and Equipment:	Resources:		

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U
		Task No. 4
Task: Determine cause of overheating using appropriate equipment to restore cooling system operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Referred to manufacturer's repair manual for diagnosis test sequence and compared the following to specifications -	_____	_____
2. Checked for loss of coolant -	_____	_____
3. Checked for restricted or reduced circulation (air and water) -	_____	_____
4. Checked ignition timing -	_____	_____
5. Checked air fuel mixture -	_____	_____
6. Checked belt tension -	_____	_____
7. Checked for cracked block, cylinder head and gasket -	_____	_____
8. Checked radiator cap -	_____	_____
9. Checked electric fan operation or (fan clutch) operation -	_____	_____
10. Repaired or replaced defective components -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cause of overheating is determined according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																																					
		Task No. 5																																					
Task: Test thermal sensing switch using appropriate equipment to detect a switch which opens or closes outside of manufacturer's specifications.																																							
<table border="0"> <thead> <tr> <th style="text-align: left;">Achievement Indicators:</th> <th style="text-align: left;">The learner:</th> <th style="text-align: center;">Yes</th> <th style="text-align: center;">No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure for testing thermal sensing switch -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>2. Substituted a good unit in place of the suspected one (bimetal gauges) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>3. Checked operation of the gauge (bimetal gauges) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>4. Replaced gauge or sending unit (bimetal gauges) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>5. Disconnected wire at sending unit, gauge should move to the cold position (magnetic gauges) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>6. Grounded wire at sending units-gauge should move to the hot position (magnetic gauges) -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>7. Checked operations of the magnetic gauges -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td>8. Replaced gauge or sending unit -</td> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure for testing thermal sensing switch -		_____	_____	2. Substituted a good unit in place of the suspected one (bimetal gauges) -		_____	_____	3. Checked operation of the gauge (bimetal gauges) -		_____	_____	4. Replaced gauge or sending unit (bimetal gauges) -		_____	_____	5. Disconnected wire at sending unit, gauge should move to the cold position (magnetic gauges) -		_____	_____	6. Grounded wire at sending units-gauge should move to the hot position (magnetic gauges) -		_____	_____	7. Checked operations of the magnetic gauges -		_____	_____	8. Replaced gauge or sending unit -		_____	_____
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and thermal switch is tested according to manufacturer's specifications.																																							
Tools and Equipment: Basic Tool Set		Resources:																																					

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																																													
		Task No. 6																																													
Task: Replace thermal sensing switch using appropriate equipment to restore switch operation.																																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for procedure to replace thermal sensing switch -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>2. Drained coolant from the system -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>3. Removed electric connections from sensing unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>4. Removed sensing unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>5. Installed sensing unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>6. Reconnected electrical leads to sensing unit -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>7. Refilled cooling system -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>8. Ran engine to normal operating temperature -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>9. Checked for leaks -</td> <td></td> <td>☐</td> <td>☐</td> </tr> <tr> <td>10. Checked for proper operation of temperature gauge -</td> <td></td> <td>☐</td> <td>☐</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for procedure to replace thermal sensing switch -		☐	☐	2. Drained coolant from the system -		☐	☐	3. Removed electric connections from sensing unit -		☐	☐	4. Removed sensing unit -		☐	☐	5. Installed sensing unit -		☐	☐	6. Reconnected electrical leads to sensing unit -		☐	☐	7. Refilled cooling system -		☐	☐	8. Ran engine to normal operating temperature -		☐	☐	9. Checked for leaks -		☐	☐	10. Checked for proper operation of temperature gauge -		☐	☐
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Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and thermal switch is replaced according to manufacturer's specifications.																																															
Tools and Equipment: Basic Tool Set	Resources:																																														

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																													
		Task No. 7																													
Task: Check variable speed fan clutch using appropriate equipment to detect lock up, bearing wear, or excessive slippage.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Referred to manufacturer's repair manual for proper procedure to test variable speed fan clutch -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Started engine run at 1000 r.p.m. until normal operating temperature is reached -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Stopped engine -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Turned fan by hand, resistance should have been felt -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Replaced fan clutch if no resistance was felt -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Replaced fan clutch if bearings were worn -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for proper procedure to test variable speed fan clutch -		_____	_____	2. Started engine run at 1000 r.p.m. until normal operating temperature is reached -		_____	_____	3. Stopped engine -		_____	_____	4. Turned fan by hand, resistance should have been felt -		_____	_____	5. Replaced fan clutch if no resistance was felt -		_____	_____	6. Replaced fan clutch if bearings were worn -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
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5. Replaced fan clutch if no resistance was felt -		_____	_____																												
6. Replaced fan clutch if bearings were worn -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and variable speed fan clutch is checked according to manufacturer's specifications.																															
Tools and Equipment:		Resources:																													

Duty: Certification: Heating and Air Conditioning
(Cooling Systems)

Duty No. U

Task No. 8

Task: Replace variable speed fan clutch using appropriate equipment to restore clutch operation.

Achievement Indicators:	The learner:	Yes	No
1.	Removed any objects that may prevent access to fan assembly -	_____	_____
2.	Loosened alternator tension bolt to take tension off the fan belt -	_____	_____
3.	Removed fan assembly mounting bolts and removed fan assembly -	_____	_____
4.	Installed fan assembly provided reversing the order of steps 1-3. Torqued all hardware -	_____	_____
5.	Performed operational check of new fan -	_____	_____

Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and variable speed fan clutch is replaced according to manufacturer's specifications with all hardware torqued.

Tools and Equipment:

Basic Tool Kit

Resources:

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U Task No. 9																													
Task: Clean cooling system using appropriate equipment and chemicals to remove impurities, scale, and dirt.																															
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Drained existing coolant from block and radiator -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Filled with water and chemical flushing agent to manufacturer's specifications. (NOTE: Some manufacturers recommend removing thermostat) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Ran car 20-60 minutes according to instructions -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Opened petcock and drained all water/flush mixture from radiator and block -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Closed drain and filled system with 50-50 or 60-40 mixture of coolant and water -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Tested for leaks -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Drained existing coolant from block and radiator -		_____	_____	2. Filled with water and chemical flushing agent to manufacturer's specifications. (NOTE: Some manufacturers recommend removing thermostat) -		_____	_____	3. Ran car 20-60 minutes according to instructions -		_____	_____	4. Opened petcock and drained all water/flush mixture from radiator and block -		_____	_____	5. Closed drain and filled system with 50-50 or 60-40 mixture of coolant and water -		_____	_____	6. Tested for leaks -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
1. Drained existing coolant from block and radiator -		_____	_____																												
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6. Tested for leaks -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cooling system is cleaned according to manufacturer's specifications.																															
Tools and Equipment:	Resources:																														

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U Task No. 10	
Task: Replace thermostat using appropriate equipment to restore thermostat operation.			
Achievement Indicators: The learner:		Yes	No
1. Drained the coolant -		_____	_____
2. Removed any objects that prevented access to the thermostat housing -		_____	_____
3. Removed the thermostat housing and thermostat -		_____	_____
4. Cleaned the gasket surfaces -		_____	_____
5. Installed thermostat and housing using a new gasket -		_____	_____
6. Installed any objects removed to obtain access -		_____	_____
7. Filled the cooling system to the required level with the proper coolant -		_____	_____
8. Pressure tested the system for leaks -		_____	_____
9. Ran engine to normal operating temperature and rechecked coolant level -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and thermostat is replaced according to manufacturer's specifications and so coolant does not leak.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																													
		Task No. 11																													
Task: Test thermostat using appropriate equipment to detect opening temperature deviation from temperature stamped on thermostat.																															
<table border="0"> <tr> <td>Achievement Indicators:</td> <td>The learner:</td> <td>Yes</td> <td>No</td> </tr> <tr> <td>1. Placed a container with water on a suitable heating element (hot plate, stove, bunson burner, etc.) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Placed a thermometer in the water -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Placed the thermostat in the water -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Heated water until thermostat began to open (noted water temperature) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Compared thermostat opening with temperature rating on thermostat -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Replaced thermostat if readings deviated from specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </table>				Achievement Indicators:	The learner:	Yes	No	1. Placed a container with water on a suitable heating element (hot plate, stove, bunson burner, etc.) -		_____	_____	2. Placed a thermometer in the water -		_____	_____	3. Placed the thermostat in the water -		_____	_____	4. Heated water until thermostat began to open (noted water temperature) -		_____	_____	5. Compared thermostat opening with temperature rating on thermostat -		_____	_____	6. Replaced thermostat if readings deviated from specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																												
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3. Placed the thermostat in the water -		_____	_____																												
4. Heated water until thermostat began to open (noted water temperature) -		_____	_____																												
5. Compared thermostat opening with temperature rating on thermostat -		_____	_____																												
6. Replaced thermostat if readings deviated from specifications -		_____	_____																												
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and thermostat is tested according to manufacturer's specifications.																															
Tools and Equipment: Thermostat Tester		Resources:																													

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																																	
		Task No. 12																																	
Task: Test radiator pressure cap using appropriate equipment to detect a cap opening at a different pressure than that stamped on the cap.																																			
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Removed radiator pressure cap -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Visually inspected spring and seal -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Using adapter provided, installed radiator cap on pressure pump and adapter -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Using pump provided, applied specified pressure to cap (specified pressure may be found on top side of radiator cap) -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Noted pressure required to unseat relief valve -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Noted any pressure drop below specified pressure -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Replaced cap if it does not meet specifications -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Achievement Indicators:	The learner:	Yes	No	1. Removed radiator pressure cap -		_____	_____	2. Visually inspected spring and seal -		_____	_____	3. Using adapter provided, installed radiator cap on pressure pump and adapter -		_____	_____	4. Using pump provided, applied specified pressure to cap (specified pressure may be found on top side of radiator cap) -		_____	_____	5. Noted pressure required to unseat relief valve -		_____	_____	6. Noted any pressure drop below specified pressure -		_____	_____	7. Replaced cap if it does not meet specifications -		_____	_____
Achievement Indicators:	The learner:	Yes	No																																
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6. Noted any pressure drop below specified pressure -		_____	_____																																
7. Replaced cap if it does not meet specifications -		_____	_____																																
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radiator pressure cap is tested according to manufacturer's specifications.																																			
Tools and Equipment: Pressure Tester	Resources:																																		

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U	
		Task No. 13	
Task: Test cooling sytem using appropriate equipment including pressure tester to detect any pressure drop.			
Achievement Indicators: The learner:		Yes	No
1. Removed radiator cap -		_____	_____
2. Installed radiator tester -		_____	_____
3. Using pressure pump provided, applied specified pressure to the cooling system -		_____	_____
4. While under pressure, checked for leaks at hoses, expansion plugs, water pump, radiator, and all cooling components -		_____	_____
5. Noted pressure drop on gauge (if any) -		_____	_____
6. Replaced any defective components -		_____	_____
7. Repaired any coolant leaks -		_____	_____
8. Inspected coolant recovery tank and lines for damage -		_____	_____
9. Replaced any defective components -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and cooling system is tested according to manufacturer's specifications.			
Tools and Equipment: Pressure Tester		Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U
		Task No. 14
Task: Replace heater hoses using appropriate equipment to restore heater hose operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Drained cooling system below heater hose level -	_____	_____
2. Removed hose clamps at each end of the identified, defective hoses -	_____	_____
3. Grasped hose at connecting point and with a twisting motion removed hose from connection. (NOTE: It may have been necessary in some cases to split or cut hose with a knife in order to accomplish the removal) -	_____	_____
4. Made certain that all connecting points were clean and free from any foreign material such as old hose or gasket sealer -	_____	_____
5. Installed new hoses using new hose clamps where needed -	_____	_____
6. Filled system with coolant bringing it to proper level -	_____	_____
7. Bled heater and hoses. (This was accomplished by disconnecting the top most heater hose at its highest point and allowing coolant to flow through both connected points) -	_____	_____
8. Brought system to normal operating temperature and pressure tested system checking for leaks and for operation -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and heater hoses are replaced according to manufacturer's specifications so that hose connections do not leak.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U
		Task No. 15
Task: Replace radiator hoses using appropriate equipment to restore radiator hose operation.		
Achievement Indicators: The learner:		Yes No
1. Removed any objects that were necessary to obtain access to the radiator hoses -		_____
2. Drained cooling system -		_____
3. Removed the upper or lower radiator hoses (it may have been necessary to cut the old hoses to prevent damage to the radiator outlets) -		_____
4. Cleaned the water outlet connections to assure a water tight fit -		_____
5. Installed new hoses being sure they were properly located before tightening the clamps -		_____
6. Filled the cooling system to the required level with the proper coolant -		_____
7. Pressure tested the coolant system for coolant leaks -		_____
8. Ran engine to normal operating temperature and rechecked coolant level -		_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and radiator hoses are replaced according to manufacturer's specifications and hose connections do not leak.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U	
		Task No. 16	
Task: Replace radiator using appropriate equipment to restore radiator operation.			
Achievement Indicators: The learner:		Yes	No
1. Drained cooling system -		_____	_____
2. Removed any components which may have prevented access to radiator and hoses -		_____	_____
3. Disconnected upper hose from radiator only -		_____	_____
4. Disconnected lower hose from radiator only -		_____	_____
5. Disconnected transmission cooling lines from radiator (if so equipped) -		_____	_____
6. Removed cooling shroud if so equipped -		_____	_____
7. Removed radiator mounting bolts -		_____	_____
8. Removed radiator -		_____	_____
9. Installed radiator provided and repeated steps 2-8 in reverse order -		_____	_____
10. Refilled cooling system, brought to normal operating temperature -		_____	_____
11. Pressure tested system, checking for leaks and proper coolant level -		_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and a radiator is replaced according to manufacturer's specifications so the hose connections do not leak.			
Tools and Equipment: Basic Tool Set		Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																																
		Task No. 17																																
Task: Rebuild blower assembly using appropriate equipment to restore blower operation.																																		
<table border="0"> <thead> <tr> <th>Achievement Indicators:</th> <th>The learner:</th> <th>Yes</th> <th>No</th> </tr> </thead> <tbody> <tr> <td>1. Referred to manufacturer's repair manual for rebuilding a blower assembly -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>2. Disconnected electrical leads to blower -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>3. Removed upper and lower shrouds and thermostats -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>4. Checked cooling air damper -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>5. Removed blower assembly and checked bearings -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>6. Repaired or replaced all defective components -</td> <td></td> <td>_____</td> <td>_____</td> </tr> <tr> <td>7. Reassembled blower, air damper, thermostat, upper and lower shrouds -</td> <td></td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>			Achievement Indicators:	The learner:	Yes	No	1. Referred to manufacturer's repair manual for rebuilding a blower assembly -		_____	_____	2. Disconnected electrical leads to blower -		_____	_____	3. Removed upper and lower shrouds and thermostats -		_____	_____	4. Checked cooling air damper -		_____	_____	5. Removed blower assembly and checked bearings -		_____	_____	6. Repaired or replaced all defective components -		_____	_____	7. Reassembled blower, air damper, thermostat, upper and lower shrouds -		_____	_____
Achievement Indicators:	The learner:	Yes	No																															
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4. Checked cooling air damper -		_____	_____																															
5. Removed blower assembly and checked bearings -		_____	_____																															
6. Repaired or replaced all defective components -		_____	_____																															
7. Reassembled blower, air damper, thermostat, upper and lower shrouds -		_____	_____																															
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and blower assembly is rebuilt according to manufacturer's specifications.																																		
Tools and Equipment: Basic Tool Set	Resources:																																	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U
		Task No. 18
Task: Replace water pump using appropriate equipment to restore water pump operation.		
Achievement Indicators: The learner:		
	Yes	No
1. Drained cooling system -	_____	_____
2. Removed any components which may have prevented access to water pump -	_____	_____
3. Disconnected lower radiator hose at water pump -	_____	_____
4. Removed fan assembly and fan pulley if applicable -	_____	_____
5. Disconnected water pump by-pass from water pump (if so equipped) -	_____	_____
6. Removed water pump -	_____	_____
7. Cleaned block surfaces of all old gasket material -	_____	_____
8. Installed water pump provided using new gasket and proceeded with steps 2-6 in reverse order -	_____	_____
9. Filled cooling system -	_____	_____
10. Pressure tested system -	_____	_____
11. Inspected for leaks and proper coolant level -	_____	_____
Criteria: Competence in this task will be recognized when the achievement indicators are performed and water pump is replaced according to manufacturer's specifications.		
Tools and Equipment: Basic Tool Set	Resources:	

Duty: Certification: Heating and Air Conditioning (Cooling Systems)		Duty No. U																						
		Task No. 19																						
Task: Replace drive belts using appropriate equipment to restore belt operation.																								
Achievement Indicators: The learner:		<table border="1"> <thead> <tr> <th>Yes</th><th>No</th></tr> </thead> <tbody> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> </tbody> </table>	Yes	No																				
Yes	No																							
Criteria: Competence in this task will be recognized when the achievement indicators are performed according to the supervisor's directions and drive belts are replaced according to manufacturer's specifications.																								
Tools and Equipment: Basic Tool Set	Resources:																							

STUDENT HAND TOOL SET(S) (BASIC AND ADVANCED)

Basic Tool Set

Adjustable Wrench - 10"

Battery Tools

Battery Nut Pliers

Battery Post Puller

Battery Post Cleaner

Belt Tension Gauge

Blow Gun - Rubber Tip (OSHA approved)

Brake Tools

Brake Bleeder Wrench

Brake Spoons

Chisel - 5/8" Cold Chisel

Combinations Wrenches

7/16" thru 1"

7mm thru 15mm

Creeper

Filter Wrench - Oil and Gas

Files - 10" Coarse, 6" Fine

Hack Saw

Hammers

Medium Ball Peen

Soft Face

Magnetic Pickup Tool

Mechanics Steel Ruler

Oil Can - Pump type

Pipe Wrench - 8"

Pliers

Needle Nose

All Purpose

Hose Clamp

Side Cutters

Vise Grip

Slip Joint (water pump)

Punches

1/4" and 1/8" Pin Punch

3/8" Taper Punch

3" Center Punch

Safety Glasses

Scraper - 1 1/2" Wide

Screwdriver Set (Common)

Screwdriver Set (Phillips)

Screwdriver Set (Torx)

Screwdriver Set (Posi-drive)

Screw Pitch Gauge

N.F., N.C., Metric

Screw Starter

Socket Set 3/8" Drive

5/16" thru 7/8" Standard (6 pt)

3/8" thru 7/8" Deep (6 pt)

6mm to 19mm

6mm to 19mm Deep

Socket Set 3/8" Drive (Continued)

Ratchet handle
Short, medium, and long extension
Spark Plug Sockets - 5/8" and 13/16"
Speed Handle
Breaker Bar
Spark Plug Gap Gauge
Spark Plug Wire Remover
Strap Wrench with webbed belt
Tape Measure
Thread Chaser Set
Tin Snips - Small
Tire Pressure Gauge
Tool Box
Torque Wrench 3/8" Drive - 50 ft/lbs
Wire Brush

ADVANCED TOOL SET
(Tools in addition to Basic Set)

Adjustable Wrench - 6"

Box End Wrench Set

3/8" - 1 1/8"

8mm - 18mm

Allen Wrench

2mm thru 12mm

.050" thru 3/8"

Brake Tools

Brake Cylinder Hone

Brake Cylinder Clamps

Brake Tools (continued)

Brake Spring Installer

Brake Plier

Brake Rotor Gauge

Chisels

3/8", 3/4" Cold Chisel

1/4" Cape Chisel

Compression Tester

Continuity Test Light

Drill

3/8" Variable Speed, Reversible

Drill Bits - 1/16" - 1/2"

Easy-Outs - 1 set

Flare Nut Wrench Set

3/8" - 1 1/16"

7mm - 17mm

Files and Handles

10" fine

6" half round

Feeler Gauges

.002" - .040" set

.006mm - .070mm set

Hammers

Heavy Ball Peen

Brass

Impact Wrench

3/8" Drive with Socket Set
(English and Metric)

Ignition Wrench

Metric Set, English Set

Open End Wrench Set

5/16" - 7/8"

8mm - 19mm

Pliers

Snap Ring

Wheel Weight

Punches

5/16", 3/16" Pin

1/2", 5/8" Tapered

6" Center Punch

Pry Bar - 16"

Puller

Two Way

Three Way

Scraper - Carbon Remover

Screwdriver (Clutch Head)

3/16", 5/16"

1/4", 3/8"

Socket Set 1/2" Drive

10mm - 25mm Standard

10mm - 25mm Deep

7/16" - 1 1/8" Standard

1/2" - 1 1/8" Deep

Ratchet

Speed Handle

Flex Handle (Breaker Bar)

Short, medium and long extension

Socket Set 1/4" Drive

3/16" - 9/16" Standard

6mm - 12mm

Ratchet

Short and long extension

Sockets (Universal)

3/8" Drive Set (English & Metric)

Soldering Gun

Torque Wrench

1/2" Drive 0-200 ft/lbs

Top Tool Chest, 6 Drawer

Tubing Cutter with flaring tool,
double flare type

Volt-Ohm Meter - 20,000 Ohms/Volt

Box End Wrenches

3/8" - 3/4" Offset

7mm - 15mm Offset

Optional

Digital-Electronic Volt Meter

Engine Tools

Cylinder Hone

Piston Ring Expander

Piston Ring Compressor

Piston Ring Groove Cleaner

Ridge Cleaner

Telescopic Gauge

Valve Spring Compressor

Files and Handles

4" and 12" Fine

6" and 12" Coarse

12" half-round

Hammers

Hand Sledge

Heavy Ball Peen

Impact Wrench

1/2" Drive with Sockets

Micrometers

0-1", 1"-2", 2"-3"

Inside Set

Roll-Around Tool Cabinet

Tach/Dwell Meter

Tap and Die Set (English and Metric)

Timing Light

Vacuum/Pressure Gauge

This section covers the tools and equipment the shop and student should have for training in any given specialty area. Obviously, many tools and equipment are the same for some or all of the specialty areas. Some equipment is specialized however, and to provide quality training must be available in the shop. No specific type or brand names are identified as this is a local option.

TOOLS AND EQUIPMENT

NOTE: All shops assumed to have an air compressor, adequate electrical capacity and fender covers.

FRONT END

Shop

Arbor Press
Bearing Packer, hand operated
Chassis Lubricator System
Floor Jack(s) - 2 TON
Hydraulic Press - 15 TON
Oxy-Acetylene Welder
Parts Cleaning Tank
Steel Work Bench(s)
Tire Mounting Machine
Wheel Alignment equipment,
rack or pit type
Wheel Balancer
1) On Car Spin Balancer
2) Off Car, Electric Type

BRAKES

Shop

Arbor Press
Axle Stands
Bearing Packer, hand operated
Bench Grinder
Brake Bleeder, Pressure
"Brake Shop", mobile with disc
attachments
Dial Indicator
Floor Jack - 2 TON
Hoist(s)
Hydraulic Press - 15 TON
Oxy-Acetylene Welder
Parts Cleaning Tank
Puller(s)
Steel Work Bench(s)

HEATING AND AIR CONDITIONING

Shop

Air Conditioner Repair Unit

Pullers, removers, adapters, special feeler gauges, and tools for late-model automobiles. System analyzer, necessary hoses, leak detector, circuit tester, thermometer, ratchet, refrigerant can dispenser valves, and portable vacuum pump.

Axle Stands

Bench Grinder

Cooling System Tester

Dial Indicator

Floor Jack- 2 TON

Gear Puller(s)

Hydraulic Press - 15 TON

Oxy-Acetylene Welder

Parts Cleaning Tank

Thermostat Tester

TUNE UP

Shop

Arbor Press

Axle Stands

Battery Charger

Battery Starter Tester

Bench Grinder

Dial Indicator Set

Distributor Tester

Emission Testing Unit

TUNE UP (continued)

Shop

Engine Analyzer with Scope, Etc.

Floor Jack

Parts Cleaning Tank

Puller Set

Spark Plug Cleaner

Steel Work Bench(s)

AUTOMATIC TRANSMISSION

Shop

Arbor Press

Axle Stands

Bench Grinder

Floor Jack(s)

Hot Tank

Hydraulic Press - 15 TON

Parts Cleaning Tank

Portable Crane (1 TON)

Puller Sets

Steel Work Bench(s)

Transmission Jack(s)

Transmission Stand(s)

ELECTRICAL SYSTEM

Shop

Arbor Press

Armature Lathe

Axle Stand(s)

ELECTRICAL SYSTEM (continued)

Shop

Battery Charger

Battery/Starter Tester

Floor Jack

Grinder

Hydraulic Press - 15 TON

Parts Cleaning Tank

Puller Set

Steel Work Bench(s)

Volt-Ampere Tester

MANUAL TRANSMISSION AND REAR AXLE

Shop

Arbor Press

Arc Welder

Axle Stands

Bench Grinder

Brake Bleeder

Floor Jack(s)

Hoist(s)

Hot Tank

Hydraulic Press - 15 TON

Lube Dispenser

Oxy-Acetylene Welder

Parts Cleaning Tank

Portable Crane (1 TON)

Puller Sets

Steel Work Bench(s)

MANUAL TRANSMISSION AND REAR AXLE (continued)

Shop

Steam or Detergent Cleaner

Transmission Jack(s)

ENGINE

Shop

Arbor Press

Axle Stand(s)

Battery Charger

Bench Grinder(s)

Engine Analyzer

Floor Jack(s)

Gear Puller Set

Hot Tank

Hydraulic Press - 15 TON

Oxy-Acetylene Welder

Parts Cleaner

Portable Crane (1 TON)

Puller Sets

Steam or Detergent Cleaner

Steel Work Bench(s)

"Valve Shop", including refacer
and seat grinder

STUDENT ACHIEVEMENT RECORD

AUTO MECHANICS

STUDENT _____

INSTRUCTIONS:

Mark each student's level of competence according to the following guide:

LEVEL

GUIDE

1

Student has been exposed to task

2

Task accomplished with assistance

3

Task accomplished to criteria by student

4

Ability to teach or demonstrate the task to others

TASK	LEVEL	DATE
A. PRACTICING AUTOMOTIVE SAFETY		
1. Review personal safety rules to become aware of personal safety rules while performing in the automotive lab.		
2. Review safety rules for handling flammables.		
3. Review safety rules for handling chemicals.		
4. Review rules for proper ventilation.		
5. Review safety rules on vehicle operation.		
6. Review safety rules for ignition system service.		
7. Review safety rules for fuel system service.		
8. Review safety rules for emission control system service.		
9. Review safety rules for servicing electrical systems.		
10. Review safety rules for servicing electrical accessories.		
11. Review safety rules for servicing the braking system.		

TASK	LEVEL	DATE
A. PRACTICING AUTOMOTIVE SAFETY (continued)		
12. Review safety rules for servicing the steering system.		
13. Review safety rules for servicing the suspension system.		
14. Review safety rules while diagnosing the engine.		
15. Review safety rules for servicing the engine block.		
16. Review safety rules for servicing the cylinder head.		
17. Review safety rules for servicing the exhaust system.		
18. Review safety rules for servicing manual transmission.		
19. Review safety rules for servicing drive-lines.		
20. Review safety rules for servicing the automatic transmission.		
21. Review safety rules for heating and air conditioning.		
22. Review safety rules for servicing the cooling system.		
23. Learn safety rules on general shop safety.		
24. Conduct individual student shop safety inspection.		
B. PRACTICING SHOP RELATED SKILLS		
1. Raise a vehicle to working height with a floor hoist.		
2. Raise a vehicle with a floor jack.		
3. Properly operate transmission jack.		
4. Drill a hole.		
5. Cut threads.		
6. Remove a broken stud.		
7. Cut metal to size the workpiece.		
8. Cut metal to remove excess metal.		
9. Draw file a metal workpiece.		
10. Set up oxy-acetylene torch.		
11. Light oxy-acetylene torch.		

TASK	LEVEL	DATE
B. PRACTICING SHOP RELATED SKILLS (continued)		
12. Cut metal.		
13. Puddle weld two metal workpieces.		
14. Braze weld metal.		
15. Determine specifications to establish fits, capacities and settings.		
16. Determine parts and labor charges.		
17. Measure selected pieces of metal.		
18. Charge a battery.		
19. Jump start a vehicle with a dead battery.		
20. Change crankcase oil.		
C. USING EMPLOYABILITY SKILLS		
1. Investigate employment information.		
2. Identify job requirements.		
3. Acquire wage information.		
4. Identify significant non-wage job characteristics.		
5. Explore employment opportunities.		
6. Analyze employment opportunities.		
7. Identify personal criteria with information about available alternatives.		
8. Prepare a resume.		
9. Write a letter of application.		
10. Complete a job application.		
11. Demonstrate appropriate dress.		
12. Complete a job interview.		
13. Describe personal criteria.		
14. Demonstrate interpersonal skills to achieve successful relationships with others.		
15. Identify source of continuing education for an occupation.		
16. Describe job termination procedures.		

TASK	LEVEL	DATE
D. PRACTICING MICHIGAN AUTO REPAIR ACT		
1. Review motor vehicle act.		
2. Prepare written estimate.		
3. Prepare a waiver of estimate.		
4. Prepare a final bill.		
5. Review mechanic certification.		
6. Prepare mechanic test registration form.		
E. CERTIFICATION: ENGINE TUNE-UP (IGNITION SYSTEM)		
1. Replace spark plugs.		
2. Gap spark plugs.		
3. Clean spark plugs.		
4. Replace ignition points.		
5. Replace condenser.		
6. Test condenser.		
7. Test point dwell.		
8. Adjust point dwell.		
9. Test spark plug wire.		
10. Replace spark plug wires.		
11. Test secondary circuit.		
12. Test primary circuit.		
13. Test ignition coil.		
14. Replace distributor cap.		
15. Replace distributor rotor.		
16. Test ignition timing.		
17. Adjust ignition timing.		
18. Test automatic spark advance.		
19. Replace automatic spark advance mechanism.		
20. Inspect distributor.		
21. Replace distributor.		
22. Rebuild distributor.		
23. Test electronic control unit.		
24. Replace electronic control unit.		
25. Test electronic pickup coil.		

TASK	LEVEL	DATE
E. CERTIFICATION: ENGINE TUNE-UP (IGNITION SYSTEM)		
(continued)		
27. Test ignition system.		
F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM)		
1. Test carburetor adjustment to detect a carburetor mixture.		
2. Test carburetor adjustment to detect hydrocarbon and carbon monoxide levels.		
3. Test carburetor adjustment using propane enrichment apparatus.		
4. Adjust carburetor idle mixture.		
5. Adjust anti-stall device.		
6. Inspect carburetor linkage.		
7. Check carburetor for vacuum leaks.		
8. Remove carburetor air cleaner.		
9. Check carburetor air cleaner element.		
10. Clean carburetor air cleaner.		
11. Clean automatic choke.		
12. Adjust automatic choke.		
13. Check manifold heat riser valve.		
14. Replace manifold heat riser valve.		
15. Clean heat riser passages.		
16. Adjust float.		
17. Adjust carburetor metering rods.		
18. Replace carburetor metering jets.		
19. Replace carburetor.		
20. Rebuild carburetor.		
21. Replace fuel filter unit.		
22. Test fuel pump.		
23. Replace fuel pump.		
24. Test fuel injection system.		
25. Replace electrical fuel injection computer.		
26. Test wiring harness for electronic fuel injection.		

TASK	LEVEL	DATE
F. CERTIFICATION: ENGINE TUNE-UP (FUEL SYSTEM)		
(continued)		
27. Replace wiring harness for electronic fuel injection.		
28. Replace fuel injection nozzle.		
29. Rebuild fuel injection nozzle.		
30. Replace fuel injection pump.		
31. Rebuild fuel injection pump.		
32. Test waste gate adjustment.		
33. Adjust waste gate.		
34. Replace turbo-charger.		
35. Rebuild turbo-charger.		
36. Replace fuel lines.		
37. Replace fuel tank.		
38. Replace fuel level sending unit.		
G. CERTIFICATION: ENGINE TUNE UP (EMISSION CONTROL SYSTEM)		
1. Test P.C.V. system.		
2. Replace P.C.V. valve.		
3. Replace P.C.V. valve hoses.		
4. Replace vacuum hoses.		
5. Test idle solenoid.		
6. Replace idle solenoid.		
7. Test thermostatic air cleaner.		
8. Adjust thermostatic air cleaner.		
9. Replace thermostatic air cleaner.		
10. Test exhaust gas recirculation valve.		
11. Replace exhaust gas recirculation valve.		
12. Test fuel evaporation.		
13. Replace closed system charcoal canister filter.		
14. Test vacuum advance/retard device.		
15. Replace vacuum advance/retard device.		
16. Test electrical advance/retard device.		
17. Replace deceleration valve.		

TASK	LEVEL	DATE
G. CERTIFICATION: ENGINE TUNE-UP (EMISSION CONTROL SYSTEM) (continued)		
18. Test air injection system.		
19. Replace air pump.		
20. Replace diverter and anti-backfire valve.		
21. Test back pressure of exhaust system.		
22. Replace catalytic converter.		
23. Test emission control system.		
24. Replace beads in catalytic converter.		
H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL)		
1. Test battery electrolyte level.		
2. Test battery to detect any cell with specific gravity less than 1.220.		
3. Test battery for surface leakage.		
4. Test battery voltage.		
5. Test battery capacity (load).		
6. Clean battery post and cable connections.		
7. Test ground system resistance.		
8. Replace battery cables.		
9. Charge battery.		
10. Test charging system output.		
11. Test generator output.		
12. Test alternator output.		
13. Replace generator or alternator.		
14. Rebuild generator.		
15. Rebuild alternator.		
16. Replace charging system alternator.		
17. Test starter control circuit.		
18. Test starter current draw.		
19. Replace starter solenoid.		
20. Test electrical motors.		
21. Replace starter.		
22. Rebuild starter.		

TASK	LEVEL	DATE
H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL)		
(continued)		
23. Test switches.		
24. Replace switches.		
25. Test fuses.		
26. Replace fuses.		
27. Test circuit breakers.		
28. Replace circuit breakers.		
29. Replace fuse block assembly.		
30. Test lighting system.		
31. Replace light bulbs.		
32. Replace bulb sockets.		
33. Adjust headlights.		
34. Test parking light and headlight circuit.		
35. Replace dimmer switch.		
36. Test turn signal circuit.		
37. Replace turn signal.		
38. Adjust back up light switch.		
39. Replace back up light switch.		
40. Adjust stop light switch.		
41. Replace stop light switch.		
42. Test horn circuit.		
43. Test horn relay.		
44. Replace horn relay.		
45. Test windshield wiper circuit.		
46. Replace windshield wiper motor.		
47. Replace windshield washer motor.		
48. Test constant voltage regulator.		
49. Replace constant voltage regulator.		
50. Test instrument gauges.		
51. Replace instrument gauges.		
52. Test sending units.		
53. Replace sending units.		
54. Test warning lamps.		

TASK	LEVEL	DATE
H. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL)		
(continued)		
55. Replace warning lamps.		
I. CERTIFICATION: ELECTRICAL SYSTEMS (ELECTRICAL ACCESSORIES)		
1. Test cruise control unit.		
2. Replace cruise control components.		
3. Test automatic alarm system.		
4. Replace automatic alarm system.		
5. Test radio power circuit.		
6. Test radio speaker.		
7. Replace radio speaker.		
8. Test radio antenna.		
9. Replace radio antenna.		
10. Adjust radio antenna.		
11. Replace power antenna.		
12. Replace power window motors.		
13. Replace power seat motors.		
14. Test cigarette lighter circuit.		
15. Replace cigarette lighter receptacle.		
16. Test rear window defogger circuit.		
17. Test power trunk mechanism.		
18. Replace power trunk mechanism.		
J. CERTIFICATION: BRAKES (BRAKES AND BRAKING SYSTEMS)		
1. Test brake operation.		
2. Test brake hose, lines, and fittings.		
3. Flush brake system.		
4. Replace brake hose.		
5. Replace brake lines.		
6. Bleed brake system.		
7. Adjust brake shoes.		
8. Free parking brake cable and linkage.		

TASK	LEVEL	DATE
J. CERTIFICATION: BRAKES (BRAKES AND BRAKING SYSTEMS)		
(continued)		
9. Adjust parking brake linkage.		
10. Replace parking brake cable and linkage.		
11. Replace parking brake external band.		
12. Replace brake shoes.		
13. Replace self-adjusters.		
14. Replace wheel cylinder.		
15. Rebuild wheel cylinder.		
16. Grind brake drum.		
17. Recondition backing plate.		
18. Replace disc brake rotor.		
19. Reface disc brake rotor.		
20. Replace caliper assembly.		
21. Rebuild caliper.		
22. Replace master cylinder.		
23. Rebuild master cylinder.		
24. Replace hydraulic power assist unit.		
25. Replace hydro-brake booster unit.		
26. Replace proportioning or metering valve (combination valve)		
27. Test brake anti-lock system.		
28. Replace brake anti-lock system components.		
K. CERTIFICATION: FRONT END AND STEERING SYSTEMS		
(STEERING SYSTEMS)		
1. Inspect steering gear.		
2. Inspect steering linkage.		
3. Lubricate steering linkage.		
4. Check manual steering gear fluid level.		
5. Check power steering fluid level.		
6. Check tire pressure.		
7. Rotate tires.		
8. Balance wheels and tires (on-the-car dynamic).		

TASK	LEVEL	DATE
K. CERTIFICATION: FRONT END AND STEERING SYSTEMS (STEERING SYSTEMS) (continued)		
9. Balance wheels and tires (off-the-car dynamic).		
10. Balance wheels and tires (off car static).		
11. Replace steering linkage components.		
12. Replace manual steering sector.		
13. Adjust steering sector.		
14. Align front end.		
15. Adjust toe.		
16. Align rear wheels.		
17. Replace steering damper.		
18. Replace power steering hoses.		
19. Replace belts.		
20. Replace power steering cylinder.		
21. Rebuild power steering cylinder.		
22. Replace power steering control valve assembly.		
23. Rebuild power steering control valve assembly.		
24. Replace power steering pump.		
25. Rebuild power steering pump.		
26. Rebuild rack and pinion steering assembly.		
27. Rebuild rack and pinion manual steering assembly.		
28. Replace steering wheel.		
29. Replace ignition switch rack.		
30. Replace steering mast jacket.		
L. CERTIFICATION: FRONT END AND STEERING SYSTEMS (SUSPENSION SYSTEMS)		
1. Inspect tires and wheels.		
2. Inspect suspension system.		
3. Replace suspension bushings.		
4. Repack wheel bearings.		
5. Replace front wheel bearings (drum brake).		
6. Replace front wheel bearings (disc brakes).		

TASK	LEVEL	DATE
L. CERTIFICATION: FRONT END AND STEERING SYSTEMS		
(SUSPENSION SYSTEMS) (continued)		
7. Replace shock absorbers.		
8. Replace ball joints.		
9. Replace coil spring(s).		
10. Replace control arms.		
11. Replace torsion bar(s).		
12. Replace spindle.		
13. Replace king pins.		
14. Replace McPherson Strut assembly.		
15. Rebuild McPherson Strut assembly.		
16. Replace trunion pin assembly.		
17. Replace leaf spring assembly.		
M. CERTIFICATION: ENGINE REPAIR (DIAGNOSE THE ENGINE)		
1. Test cylinder balance.		
2. Test cylinder leakage.		
3. Test vacuum leaks.		
4. Test valve train and guides.		
5. Detect oil leaks.		
6. Detect engine noises.		
N. CERTIFICATION: ENGINE REPAIR (CYLINDER BLOCK)		
1. Clean engine.		
2. Replace core plugs.		
3. Test oil pump pressure.		
4. Test oil pressure relief valve.		
5. Replace engine mounts.		
6. Replace engine assembly.		
7. Replace oil pans.		
8. Replace rod bearings.		
9. Replace pistons.		
10. Replace crankshaft.		
11. Test engine block.		

TASK	LOG	DATE
0. CERTIFICATION: ENGINE REPAIR (CYLINDER HEAD)		
1. Inspect rocker arms.		
2. Adjust hydraulic valve lifters.		
3. Adjust mechanical lifters.		
4. Test valve lifters.		
5. Replace intake manifold.		
6. Replace cylinder head.		
7. Test cylinder head.		
8. Rebuild cylinder head.		
9. Replace harmonic balancer.		
10. Replace timing chain or belt.		
11. Replace timing gear.		
12. Replace camshaft.		
13. Replace camshaft bearings.		
P. CERTIFICATION: ENGINE REPAIR (EXHAUST SYSTEM)		
1. Check exhaust system for leaks and restrictions.		
2. Replace exhaust system supports.		
3. Replace muffler.		
4. Replace tailpipe.		
5. Replace exhaust pipe.		
6. Replace exhaust manifold.		
Q. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES (MANUAL TRANSMISSIONS)		
1. Adjust manual clutch.		
2. Adjust hydraulic clutch free travel.		
3. Adjust shift linkage.		
4. Replace extension housing seal and bushing.		
5. Replace manual transmission.		
6. Replace pressure plate assembly.		
7. Replace and align clutch disc.		
8. Replace clutch release bearing.		
9. Replace clutch release fork.		

TASK	LEVEL	DATE
Q. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES (MANUAL TRANSMISSIONS) (continued)		
10. Replace pilot bearing.		
11. Test flywheel runout.		
12. Replace flywheel.		
13. Test bellhousing runout.		
14. Rebuild manual transmission.		
15. Replace hydraulic clutch slave cylinder.		
16. Rebuild hydraulic clutch slave cylinder.		
17. Replace hydraulic clutch master cylinder.		
18. Rebuild hydraulic clutch master cylinder. ✓		
R. CERTIFICATION: MANUAL TRANSMISSION, FRONT AND REAR AXLES (DRIVE LINES)		
1. Test drive line.		
2. Lubricate universal joints.		
3. Replace universal joints.		
4. Replace trunion joints.		
5. Lubricate speedometer cable.		
6. Replace speedometer cable.		
7. Replace speedometer drive gear.		
8. Replace axle seal.		
9. Replace rear axle bearing.		
10. Balance drive shaft in the car.		
11. Replace transmission mount.		
12. Check drive line angles.		
13. Replace integral differential assembly.		
14. Replace removable differential assembly.		
15. Rebuild integral differential assembly.		
16. Rebuild removable differential assembly.		
17. Replace trans-axle assembly.		
18. Rebuild trans-axle assembly.		
19. Replace front-drive axle assemblies.		
20. Rebuild 4 wheel drive locking hubs.		

TASK	LEVEL	DATE
S. CERTIFICATION: AUTOMATIC TRANSMISSIONS (AUTOMATIC TRANSMISSIONS)		
1. Test transmission in car using pressure.		
2. Test transmission in car using stall procedures.		
3. Clean transmission oil strainer.		
4. Replace transmission filter.		
5. Adjust automatic transmission shift linkage.		
6. Test vacuum shift modulator.		
7. Replace vacuum shift modulator.		
8. Adjust bands.		
9. Replace transmission governor.		
10. Clean transmission governor.		
11. Clean transmission valve body.		
12. Replace automatic transmission with converter assembly.		
13. Replace automatic transmission without converter assembly.		
14. Rebuild automatic transmission assembly.		
15. Test converter turbine end play.		
16. Air pressure test transmission on a bench.		
17. Flush converter assembly.		
18. Flush automatic transmission cooler assembly.		
19. Replace torque converter.		
20. Replace extension housing seal and bushing.		
21. Splice transmission cooler lines.		
T. CERTIFICATION: HEATING AND AIR CONDITIONING (HEATING AND AIR CONDITIONING)		
1. Test control cables.		
2. Test electrical control circuits.		
3. Replace compressor belts.		
4. Test vacuum components.		
5. Replace vacuum components.		
6. Test air conditioning thermal switches.		

TASK	LEVEL	DATE
T. CERTIFICATION: HEATING AND AIR CONDITIONING (HEATING AND AIR CONDITIONING) (continued)		
7. Test blower.		
8. Replace blower motor.		
9. Test thermostatic clutch switch.		
10. Replace thermostatic clutch switch.		
11. Test air conditioning magnetic clutch switch.		
12. Replace air conditioning magnetic clutch.		
13. Test clutch and pulley assembly.		
14. Replace clutch and hub assembly (rotary type).		
15. Replace compressor seals.		
16. Test air conditioner charge.		
17. Charge system using one pound cans.		
18. Charge system using bulk charge.		
19. Perform leak test.		
20. Replace refrigerant lines.		
21. Fabricate refrigerant lines.		
22. Test compressor oil level.		
23. Test dryer.		
24. Replace dryer in air conditioning unit.		
25. Replace condenser in air conditioning unit.		
26. Replace evaporator.		
27. Replace heater core.		
28. Replace measured orifice valve (expansion valve).		
29. Test throttle suctioning valve.		
30. Replace throttle suctioning valve.		
31. Test compressor reed plates.		
32. Replace compressor reed plates.		
33. Replace compressor.		
34. Rebuild rotary compressor (swash-plate).		
35. Install air conditioning system.		

[illegible]

STUDENT ACHIEVEMENT RECORD

STUDENT: _____

INSTRUCTIONS.

Mark each student's level of competence according to the following guide.

<u>LEVEL</u>	<u>GUIDE</u>
1	Student has been exposed to task
2	Task accomplished with assistance
3	Task accomplished to criteria by student
4	Ability to teach or demonstrate the task to others

[illegible]

GLOSSARY OF VOCATIONAL TERMS

Advisory Committee. An appointed group of concerned citizens and educators representative of the occupations for which training is given in the local school, organized for the purpose of helping to plan vocational programs and offering counsel on their development and operation.

Apprenticeship. An instructional program in which the learner works directly under a qualified craft worker to learn a trade.

Career Development. A lifelong process involving a series of experiences, decisions, and interactions, which, taken cumulatively, results in the formulation of a viable self concept and provides the means through which that self concept can be implemented both vocationally and avocationally.

Career Education. The total effort of public education and the community to help all individuals become familiar with the values of a work-oriented society, to integrate such values into their personal value systems, and to implement those values into their lives in such a way that work becomes possible, meaningful, and satisfying to each individual.

Career Interest. The student's decision to pursue a job description or cluster within a vocational education program area.

Cluster of Occupations. Occupations for which a common core of instruction can prepare, as for example automotive trades which prepares for such occupations as auto mechanic, auto body repairman, automotive services, auto inspector, and brake adjuster.

Completion. That statistic which describes individuals, including early leavers who have achieved their immediate objectives in preparation for entry or progressing in an occupational field and have left the vocational education program.

Cooperative Vocational Education. An instructional plan which combines learning experiences gained through regularly scheduled supervised employment in the community and vocationally oriented in-school instruction.

Coordinator (Cooperative Education). A member of a local school staff who teaches occupational and related subject content to students preparing for employment and coordinates the efforts of all helpful agencies which can assist in a training program designed to meet the needs of learners in a cooperative vocational education program. At times the coordinator may have varying degrees of responsibility in adult vocational education.

Course. A defined segment of a program.

Course Outline. An outline of subject matter to be presented or Learning experiences planned for a course.

Course of Study. A guide prepared by administrators, supervisors, and teachers of a particular school or school system as an aid to teaching a given subject or area of study. More detailed than a course outline and includes statement of methods, materials, and equipment needed.

Curriculum. A sequence of educational and skill development experiences designed to accomplish a particular purpose. The curriculum for a program of vocational/technical education is designed to prepare an individual for entry, promotion, or upgrading in a specific occupation or cluster of occupations. (See definition of Cluster of Occupations.)

Disability. An injury or illness, temporary or permanent, which prevents workers from carrying on their usual occupations. A disability retirement is retirement because of physical inability to perform the job.

Disadvantaged. Disadvantaged persons are those who have academic, socioeconomic, cultural, or other handicaps that prevent them from succeeding in a regular vocational program designed for persons without such handicaps, and who for that reason require specially-designed educational programs and related services, or both, in order for them to benefit from a vocational program.

Discharge. Dismissal of a worker from employment. The term implies discipline for unsatisfactory performance and thus is usually limited to dismissals for such reasons as insubordination, absenteeism, or inefficiency.

Discrimination. Unequal treatment of workers in hiring, employment, pay or conditions of work because of race, national origin, creed, color, sex, age, union membership activity, or any other characteristics not related to ability or job performance. Discrimination is prohibited by Federal, State, and local laws.

Duty. A large segment of work performed by an individual. It is one of the distinct major activities involved in the work performed, and it is composed of several related tasks.

Employer. General term for any individual, corporation, or other operating group which hires workers. The term "employer" and "management" are often used interchangeably.

Evaluation. A measuring or assessing of effectiveness. An on-going process by which effectiveness and progress are determined, used to guide change and offer directions for program modification and operation.

Exploratory Experiences. Those experiences in a variety of occupations, which help the students identify job traits in relation to their abilities and characteristics, and to assist them in making realistic and appropriate occupational choices.

Follow-Up Report. Usually a composite short-term or long-term report of former students indicating their present employment status or other present commitments (education, military, homemaking). More sophisticated follow-up studies seek to assess the effectiveness of the cooperative training experience to the student's present situation. Individual follow-up information is usually maintained in a student's record file.

Follow-Up Study. A study of the occupational status and progress of former students, as a means of evaluating effectiveness of the school's program of occupational preparation, of improving such preparation, and/or of determining needs of former students for further services.

General Advisory Committee. A committee that advises an institution as to its vocational/technical education activities overall. (See also; Occupational Advisory Committee).

Guidelines. The means by which significant characteristics in the evaluation of an institution or program are identified or measured.

Handicapped. Handicapped persons are those who are mentally-retarded, hard of hearing, deaf, speech-impaired, visually-handicapped, seriously emotionally disturbed, crippled, or other health-impaired persons who, by reason of their handicapping conditions, cannot succeed in a regular vocational or consumer and homemaking education program without special educational assistance, or who require a modified vocational program.

Hazardous Occupation. An occupation designated by State of Michigan and/or federal law to be considered dangerous to the health and well-being of minors.

Individualized Instruction. That type of instruction that provides techniques through which the teacher can work directly with individual students, as opposed to group instruction.

Inservice Teacher Education. All educational, and professional activities contributing to professional competencies which a person engages in after becoming employed, such as: formal course work, work experience, internships, practicums, seminars, and independent-individualized studies.

Internship. Student performs in approved job situation. Usually paid and given credit for the work. In-school instruction usually given before the work period and seldom tied in directly with job experiences. Typically one semester or more. Internship is a term used for collegiate experiences.

Job. The duties and tasks actually performed by a specific individual.

Job Analysis. See: Occupational Analysis.

Job Description. A written statement listing the elements of a particular job or occupation. The statement may include the purpose of the job, duties, equipment used, qualifications, training requirements, physical and mental demands, and working conditions.

Job Placement. Those organized activities performed by a guidance counselor or job placement coordinator designed to assist students in locating employment.

Job Type. A group of jobs that are composed of essentially the same significant duties and tasks.

Learning Resources. All textbooks, reference materials, equipment, supplies and other items and materials needed for successful achievement of learning objectives.

Manpower. People available to perform needed labor.

Management System. A technique employed to provide an organized method of accomplishing stated mission, goals, and objectives.

Minimum Wage. The lowest rate of pay, established by law or through collective bargaining, at which covered workers may be employed. The minimum wage is usually expressed as an hourly rate.

M.O.I.S. Michigan Occupational Information System.

National Occupational Competency Exam. A written and a performance exam developed by the National Occupational Competency Testing Institute, sponsored by T&I Education, for the purpose of determining the degree of competency that one has in a specific trade and industrial occupation.

Occupational Analysis. A technique for finding out what a worker in a specific occupation does and what he needs to know to perform his job efficiently, which is then used as a means of determining the teaching content in an occupational preparatory program.

Occupational Advisory Committee. A committee advising as to a program preparing for a particular occupation or cluster of occupations.

Occupational Competence. Includes technical knowledge and skills; manipulative skills; communication skills; human relations skills; work habits; and the ability to reason, to solve problems, to think independently, and to make judgments necessary for satisfactory employment in the occupation.

Occupational Field. A group of recognized occupations having many similarities, including the following characteristics in common; the type of work performed; the basic aptitudes, and the acquired knowledge and training required; the tools, machines, instruments, and other equipment used; and the basic materials used.

Occupational Objective. An occupational goal, selected by the student, the attainment of which is the purpose for his/her vocational instruction.

On-The-Job Training. Instruction in the performance of a sequentially planned task given a student-learner by the employer during the usual working hours of the occupation. Learning experiences at the training station comprises both the application of the theory of and the technical skill aspects of the learning situation, and/or the proper character, attitude and personality development of the student-learner as general goals of the training situation at the training station.

Occupational Information. Systematically organized data used by guidance personnel and others for the purpose of helping persons make a vocational choice. Material concerns the nature of the work, duties, responsibilities, and compensations involved in the several vocations, including information about employment outlook, promotional opportunities, and entrance requirements.

Occupational Objective. A specific recognized occupational goal, selected by the student, the attainment of which is the purpose of his vocational instruction. Also called: Career Objective.

Placement Coordinator. A person who provides local leadership to plan and initiate placement services.

Placement Services or Placement Activities. A series of coordinated activities for students planning further education or seeking part-time or full-time employment either for additional education, for on-the-job training or for earning a living.

Preparatory Instruction. Instruction preparing students for full or part-time employment. Also serves to prepare students to enter and advance in an occupation. Also serves to equip workers with new or different skills demanded by technological changes.

Preparatory Program. A preparatory program provides vocational instruction designed to prepare individuals for gainful employment as semi-skilled or skilled workers or technicians or semi-professionals in recognized occupations. Preparatory programs are provided in the school laboratory/classroom.

Professional Organizations. Groups of personnel interested in and working toward the improvement, advancement, and upgrading of activities, not only in their specific field, but also of activities in related fields of endeavor such as the American Vocational Association.

Program (Vocational Education). "Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

Related Vocational Instruction. In-school courses specifically designed to improve personal and social skills, provide needed basic education (remedial), and/or develop relevant occupational skills and knowledges. The course should be regularly scheduled, should complement the learning experiences at the training station, and should be planned and developed to meet the specific needs of the individual student. The content of this course should consist of the theory of the occupational skill, the specific related information, and the general related instruction necessary to achieve personal success in the world of work.

Resources. People, money and materials available to an institution in carrying out its purposes.

School Community. The total community from which the school draws students, support, and resources.

School District. An administrative unit at the local level which exists primarily to operate public schools or to contract for public school services. Normally, taxes can be levied by such units for school purposes. These units may or may not be coterminous with county, city or town boundaries. This term is used synonymously with the term "local basic administrative unit."

Skills. The acquisition of knowledge, ability, proficiency, dexterity and technical expertness that enables one to develop a learned power of doing a thing completely.

State Plan. The document submitted by the state board for vocational education to the U. S. Office of Education describing the state's vocational education program. Includes policies followed by the state in maintaining, extending, and implementing existing programs and establishing new programs to meet the intent of the Vocational Education Acts. Prerequisite for receiving federal funds under the Acts.

Survey, Community. A fact-finding study of socioeconomic conditions and resources, community agencies, industries, business, farming, institutional practices, problems and practices of families, etc., as they exist at a given time in a given community. It is generally used by the school as a guide in revising school offerings to meet local needs.

Survey, Occupational. A form of occupational census, taken by personnel trained to determine the number of qualified employees in a designated occupation in a specified geographic or economic area; and to evaluate the need for increasing or limiting the numbers available for employment in the occupations surveyed.

Task. A unit of worker activity that is intermediate in specificity between a function and a procedural work step or action. It is a discrete unit of work performed by an individual; that is, the unit usually has a definite beginning and ending, and it is performed within a limited period of time.

Task Analysis. A detailed listing of skills necessary to perform a clearly defined, specific job, organized into a logical sequence and which may be used for teaching employment, or classification purposes.

Task Inventory. An instrument used for conducting an occupational survey. It consists of items of identification and background information and a list of appropriate duty and task statements.

Teacher-Coordinator (Cooperative Vocational Education). A member of the local school staff who teaches technical and related subject matter to students preparing for employment and coordinates classroom instruction (related classroom) with learning activities at the training station. The coordinator is also responsible for the evaluation procedures of the program.

Trade and Industrial. Instruction planned to develop basic manipulative skills, safety practices, judgments, technical knowledge, and related occupational information for the purpose of preparing persons for initial employment in the trades and industrial occupations.

Training Agreement. A statement of fundamental agreements regarding the participation of a student in a work environment. Initiated by the school, the agreement reflects a voluntary and cooperative commitment on the part of the coordinator, employer, student, and parents/guardians.

Training Plan. A format for delineating, for each student, the learning experiences and tasks to be undertaken at the training station, often paralleled with classroom units of instruction. The training plan, cooperatively determined, usually becomes a part of the training agreement.

Training Station. The establishment providing learning experience for the student-learner.

VICA. Vocational-Industrial Clubs of America. The youth organization for students at secondary and post-secondary levels who are in preparation for employment in trade & industrial occupations.

Vocational Education. Organized educational programs, services, and activities which are directly related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career requiring other than a baccalaureate or advanced degree.

Vocational Student Organizations. Organizations for student-learners that complement the vocational education program. Recognized student-learner organizations for vocational education are: DECA, Distributive Education Clubs of America; FFA, Future Farmers of America; FHA-HERO, Future Homemakers of America-Home Economics Related Occupations; HOSA, Health Occupations Students of America; OEA, Office Education Association at the post-secondary level in Michigan and BOEC, Business Office Education Clubs at the secondary level; VICA, Vocational Industrial Clubs of America. Organizations for students enrolled in vocational education programs, with national, state and local units, the activities of which are an integral part of the instructional program.

Work Experience and Career Exploration (WECEP). Program emphasizes learning experiences at the training station based on individual needs and provides learning experiences for those students whose needs cannot be served by regular cooperative education programs.

Work Experience Program. Students perform tasks of the actual job and may or may not be paid. Typically engaged in for general education values, including exploratory. Usually one semester or less. Limited school supervision; usually no related class.

Work Observation Program. Student observes work, does not perform tasks except to understand them. Unpaid. Plan is usually few weeks in length and may be tied in with a class in which occupational information is discussed.

Work-Study Program. A federal program designed to provide a vocational education student with employment in the public sector and supplemental income while attending school. The vocational program does not necessarily have to be related to the job.

APPENDIX I
MECHANIC TRAINEE PERMIT
PROGRAM

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INFORMATION MEMORANDUM

MECHANIC TRAINEE PERMIT PROGRAM

BEGINNING JANUARY 1, 1981, PEOPLE WHO SERVICE OR REPAIR MOTOR VEHICLES MUST BE CERTIFIED MECHANICS OR HAVE A MECHANIC TRAINEE PERMIT FOR THE MAJOR REPAIR CATEGORY(IES) IN WHICH THEY WANT TO WORK.

THIS MEMORANDUM GIVES YOU THE BASIC INFORMATION YOU WILL NEED TO ANSWER THE QUESTIONS MECHANICS MAY HAVE.

WHY IS A TRAINEE PERMIT NEEDED?

MICHIGAN LAW REQUIRES ALL MAJOR REPAIRS ON MOTOR VEHICLES TO BE PERFORMED BY CERTIFIED MECHANICS AS OF JANUARY 1, 1981. HOWEVER, NEW MECHANICS REGULARLY ENTER THE FIELD, AND CERTIFIED MECHANICS MAY WANT TO BEGIN WORK IN CATEGORIES IN WHICH THEY ARE NOT CERTIFIED. THE TRAINEE PERMIT IS A SIMPLE WAY FOR A MECHANIC TO GAIN ON-THE-JOB EXPERIENCE UNDER THE SUPERVISION OF A CERTIFIED MECHANIC WITHOUT FIRST HAVING TO TAKE THE QUALIFYING TESTS.

ARE VOCATIONAL EDUCATION STUDENTS REQUIRED TO GET MECHANIC TRAINEE PERMITS?

YES.

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HOW DOES A PERSON APPLY FOR A MECHANIC TRAINEE PERMIT?

A PERSON MUST FILL OUT A FORM TITLED "APPLICATION FOR MOTOR VEHICLE MECHANIC TRAINEE PERMIT" WHICH CAN BE PROVIDED THROUGH THE MAIL FROM THE BUREAU. THE COMPLETED APPLICATION MUST BE SENT TO THE BUREAU OF AUTOMOTIVE REGULATION, ALONG WITH A CHECK OR MONEY ORDER FOR \$20.00 PAYABLE TO THE STATE OF MICHIGAN. IF THE APPLICANT ALREADY IS A STATE CERTIFIED MECHANIC, NO FEE IS REQUIRED.

HOW LONG CAN A PERSON WORK AS A MECHANIC TRAINEE?

A PERSON MAY WORK AS A MECHANIC TRAINEE IN A SPECIFIC CATEGORY FOR NOT MORE THAN TWO YEARS. BY THE END OF THE TWO-YEAR PERIOD, HE OR SHE MUST PASS THE TEST FOR THE PARTICULAR REPAIR CATEGORY AND BECOME CERTIFIED OR STOP WORKING IN THAT CATEGORY.

CAN A PERSON RENEW A TRAINEE PERMIT?

NO. MECHANIC TRAINEE PERMITS EXPIRE 24 MONTHS FROM THE DATE THEY ARE ISSUED.

CAN A PERSON BE A TRAINEE IN MORE THAN ONE REPAIR CATEGORY AT THE SAME TIME?

YES. A PERSON MAY BE A TRAINEE IN AS MANY REPAIR CATEGORIES AS HE OR SHE WISHES. HOWEVER, THE TRAINEE'S WORK IN EACH OF THE CATEGORIES MUST BE SUPERVISED BY A MECHANIC CERTIFIED IN THAT AREA. ALSO, THE TRAINEE MUST STOP WORKING IN ANY CATEGORY LISTED ON THE PERMIT IN WHICH HE OR SHE IS NOT CERTIFIED AT THE TIME THE PERMIT EXPIRES.

CAN A MECHANIC TRAINEE ADD MORE REPAIR CATEGORIES TO AN EXISTING PERMIT?

YES. THIS SAVES MONEY BUT GIVES A PERSON LESS TIME FOR ON-THE-JOB TRAINING IN THE ADDED CATEGORIES.

DO THEY HAVE TO PAY THE TRAINEE PERMIT FEE? WHY?

A RULE CHANGE RECENTLY FILED WITH THE SECRETARY OF STATE EFFECTIVE AS OF AUGUST 25, 1981, WILL NO LONGER REQUIRE THAT SECONDARY VOCATIONAL EDUCATION STUDENTS EMPLOYED IN A MAJOR VEHICLE REPAIR CATEGORY PAY A \$20.00 MECHANIC TRAINEE PERMIT FEE.

ALTHOUGH THE FEE IS NO LONGER REQUIRED, A MECHANIC TRAINEE PERMIT APPLICATION MUST BE FILED. THE APPLICATION SHOULD BE COMPLETED WITH THE CO-OP TRAINING AGREEMENT ATTACHED AND MAILED TO:

MICHIGAN DEPARTMENT OF STATE
BUREAU OF AUTOMOTIVE REGULATION
LANSING, MI 48918

THE MECHANIC TRAINEE PERMIT WILL ENABLE THE STUDENT TRAINEE TO WORK UNDER THE DIRECT SUPERVISION OF A SPECIALTY OR MASTER MECHANIC DURING THE TIME OF EMPLOYMENT IN ONE OR MORE OF THE MAJOR MOTOR VEHICLE REPAIR CATEGORIES.

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EXAMPLE: A PERSON HAS A TEN-MONTH OLD TRAINEE PERMIT IN ELECTRICAL SYSTEMS AND AUTOMATIC TRANSMISSION. THE PERSON WANTS TO DO ENGINE REPAIR AND BRAKE REPAIR. THESE TWO ADDITIONAL CATEGORIES MAY BE ADDED TO THE EXISTING PERMIT AT NO COST. WHEN THE PERMIT EXPIRES IN 14 MONTH, HOWEVER, THE TRAINEE MUST STOP WORKING IN ANY CATEGORY LISTED ON THE PERMIT IN WHICH HE OR SHE HAS NOT BECOME CERTIFIED.

IF A PERSON FEELS THAT A FULL TWO YEARS OF ON-THE-JOB EXPERIENCE AND TRAINING IN A REPAIR CATEGORY MIGHT BE NEEDED BEFORE TAKING THE TESTS, THEN HE OR SHE SHOULD APPLY FOR A NEW TRAINEE PERMIT. THE COST WOULD BE \$20.00, UNLESS HE OR SHE ALREADY IS CERTIFIED IN OTHER CATEGORIES.

MUST THE MECHANIC TRAINEE'S NAME APPEAR ON THE FINAL STATEMENT OF REPAIRS GIVEN THE CUSTOMER?

YES. IF THE MECHANIC TRAINEE WAS INVOLVED IN PERFORMING THE REPAIRS, HIS OR HER NAME MUST APPEAR ON THE FINAL STATEMENT OF REPAIRS OR INVOICE. IF THE REPAIRS WERE MAJOR REPAIRS, THE NAME AND CERTIFICATION NUMBER OF THE CERTIFIED MECHANIC WHO SUPERVISED THE TRAINEE'S WORK MUST ALSO APPEAR ON THE FINAL STATEMENT OF REPAIRS OR INVOICE.

FOR MORE INFORMATION: BUREAU OF AUTOMOTIVE REGULATION
LANSING, MICHIGAN 48918
TELEPHONE: 517 373-9460

MECHANIC TRAINING

PREPARATORY TRAINING OF MECHANICS:

- THE RESPONSIBILITY OF EXISTING SECONDARY AND POST-SECONDARY SCHOOLS;
- INCLUDES LOCAL HIGH SCHOOLS, AREA SKILL CENTERS, COMMUNITY COLLEGES, PRIVATE TRADE SCHOOLS AND FOUR-YEAR COLLEGES;
- NO SPECIAL ARRANGEMENT FOR CONDUCTING PREPARATORY PROGRAMS IS NEEDED. INSTRUCTORS MAY CONDUCT LIVE REPAIR WORK AS PART OF THE LEARNING EXPERIENCE WITHOUT REGISTRATION OF THE SHOP OR HAVING WORK DONE ON CUSTOMER VEHICLES BY CERTIFIED MECHANICS;
- CO-OP TRAINING OR INTERNSHIPS OPERATED AFTER JANUARY 1, 1981, WILL REQUIRE THAT THE TRAINEE OBTAIN A MECHANIC TRAINEE PERMIT IN ORDER THAT STUDENTS BE ALLOWED TO PERFORM MAJOR REPAIRS. PERMITS ARE GOOD FOR TWO YEARS AND CANNOT BE RENEWED. PERMITS ARE ISSUED IN ONE OR MORE SPECIALTY REPAIR CATEGORIES. PERMITS FOR DIFFERENT SPECIALTY REPAIR CATEGORIES MAY BE ISSUED FOR ANOTHER TWO-YEAR PERIOD.

MECHANIC CONTINUING EDUCATION

INTENDED TO PROVIDE THE OPPORTUNITY FOR CERTIFIED MECHANICS TO OBTAIN TECHNICAL UPDATING ON TOPICS WITHIN THE MECHANICS' SPECIALTIES.

CONTINUING EDUCATION COURSES, SEMINARS OR WORKSHOPS WILL:

- BE CONVENIENT AND AS INEXPENSIVE AS POSSIBLE FOR THE MECHANIC TO ATTEND;
- BE CONDUCTED AT COMMUNITY COLLEGES, PRIVATE TRADE SCHOOLS, AREA SKILL CENTERS AND LOCAL HIGH SCHOOLS AS REQUIRED TO MEET LOCAL NEEDS;
- SUPPLEMENT MANUFACTURER TRAINING EFFORTS AS WELL AS AFTER-MARKET SUPPLIER TRAINING OPPORTUNITIES (I.E., MOOG, DELCO, CHAMPION);
- BE SUPPORTED BY THE BUREAU OF AUTOMOTIVE REGULATION IN TERMS OF PUBLICATION OF SCHEDULES, ANNOUNCEMENTS AND REGISTRATION FORMS, AND OTHER SUPPORTIVE MEANS;
- BE CONDUCTED ONLY BY HIGHLY QUALIFIED INSTRUCTORS: INSTRUCTOR TRAINING WILL BE AVAILABLE THROUGH A COOPERATIVE EFFORT OF THE BUREAU, THE MANUFACTURER AND SELECTED FOUR-YEAR TECHNICAL TEACHER TRAINING COLLEGES.

OTHER TRAINING

ON OR ABOUT SEPTEMBER 15, 1979, A TEACHING MODULE ON THE MOTOR VEHICLE SERVICE AND REPAIR ACT WILL BE AVAILABLE TO ALL SCHOOLS OFFERING AUTO MECHANIC COURSES.

THE MODULE IS DESIGNED TO PROVIDE THE INFORMATION THE TEACHER NEEDS TO INSTRUCT STUDENTS IN THE UNDERSTANDING AND USE OF PA 300 AS AMENDED.

A DIRECTORY OF POST-SECONDARY SCHOOLS IN MICHIGAN WILL BE AVAILABLE SOON. THE DIRECTORY CONTAINS THE LOCATION, THE NAME OF A CONTACT PERSON OR OFFICE, AND A BRIEF DESCRIPTION OF THE PROGRAMS OFFERED. THIS WILL BE WIDELY DISTRIBUTED TO SCHOOLS AND PUBLIC AGENCIES FOR USE IN COUNSELING AND CAREER PLANNING.

APPENDIX II

A GLOSSARY OF TERMS FOR
MOTOR VEHICLE REPAIR

Glossary of Terms

The following list of terms or words covers all repair categories and is in alphabetic order. A mechanic may not be completely familiar with these words or terms. It is suggested that the mechanic study the list and look up the meaning of those which are not familiar or are not completely clear. These words or terms may be used on tests and are therefore important to understand.

AC	Brake Shoe Toe	Collapsed (Piston)
Accelerator	Braker Points	Combustion Chamber
Accumulator Piston	Brush (Alternator)	Commutator
Adjusting Sleeve	Bushing	Compensating Port
Advance (Ignition Timing)	Butterfly Valve	Compensator Valve
AIR (Air Injector Reactor)	Bypass Filter	(Automatic Transmission)
Air-Fuel Ratio	Bypass Valve	Compression
Air Gap (Regulator)		Compression Stroke
Air Pollution		Condensation
Align	Calliper	Condenser
Alternator	Cam	Constant Velocity
Ambient Pressure Sensor	Cam Lobe	Universal Joint
Ambient Temperature	Cam Angle or Dwell	Contact Points or
Ammeter	(Ignition)	Breaker Points
Ampere	Cam Ground	Contaminated
Anti-Backfire Valve	Camshaft	Coolant
Antifreeze	Camber	Cutter Pin
Anti-Friction Bearing	Canister Purge Valve	Countershaft (Transmission)
Armature	Capacitance	Crankcase
Automatic Choke	Carbon	Crankshaft
	Carbon Monoxide	Crank Journal
	Carburetor	Crankshaft End Play
	Carburetor Circuits	Crocus Cloth
	Carburetor Needle	Crossfiring
	Cardan Joint & Double	CTO Switch--Coolant
	Cardan Joint	Temperature Override
	CAS (Cleaner Air	Switch
	System)	
	Caster	Cubic Inch
	Catalytic Converter	Cupping
	CCS (Controlled Combustion	Current
	Systems)	Cylinder Bore Gauge
	CEC (Combination Emission	Cylinder Head
	Control)	Cylinder Hone
	Centrifugal--Advance	Cylinder Liner
	(Distributor)	Cylinder Sleeve
	Check Valve	
	Choke	DC
	Clearance	Dashpot
	Clogged	Detonation
	Cluster or Counter	Diagnosis
	Gear	Dial Gauge or Indicator
	Clutch	Diaphragm
	Clutch Housing or	Dieseling
	Bell Housing	Differential
	Clutch Pedal--	Differential Case
	Free Play	Differential Pinion Nose
	Clutch Pilot Bearing	Angle
	Clutch Pressure Plate	Diode
	CO--Carbon Monoxide	Disc Lateral (Axial)
	Coil (Ignition)	Run-Out
	Coil Spring	Disc Radial Run-Out

Polarity (Battery Terminals)
 Polarity (Generator)
 Power Steering
 Preignition
 Primary Venturi
 Preloading
 Press-Fit
 Pressure Bleeder
 Pressure Cap
 Pressure Relief Valve
 Primary Circuit
 Primary, Forward or Leading
 Brake Shoe
 Primary Winding (Coil)
 Primary Wires
 Propeller Shaft
 Proportioning Valve
 PSI (Pounds per Square
 Inch)
 Pulsating Brake
 Pump Housing
 Purge
 Push Rod
 PVS (Ported Vacuum Switch)

 Race (Bearing)
 Rack and Pinion Steering
 Radial Run-Out
 Rear End Drive Pinion
 Refrigerant-12
 Regulator (Electrical)
 Relay
 Reluctor
 Residual Check Valve
 Resistance
 Resistor
 Resistor Spark Plug
 Retard (Ignition Timing)
 Reverse Flush
 Reverse Idler Gear
 Ridge Reamer
 Ring Compressor
 Ring Gap
 Ring Gear
 Ring Grooves
 Ring Ridge
 Rocker Arm
 Rocker Arm Shaft
 Rod Bearing
 Rod Cap
 Rosin
 Rotor (Distributor)

 "S" Cam Brake
 Sal Ammonia Paste
 Schrader Valve (Air
 Conditioning)
 SCS (Speed Control Switch)
 Scuffing
 Secondary, Reverse or
 Trailing Brake Shoe

Self-Energizing
 Series-Parallel Circuit
 Servo (Transmission)
 Shift Forks
 Shift Point
 Shim
 Shroud
 Shimmy
 Short or Short Circuit
 Shrink-Fit
 Single Piston Floating
 Caliper Disc Brakes
 Sliding Gear
 Slip Joint
 Sludge
 Solenoid
 Solvent
 Spark Advance
 Specific Gravity
 Spider Gear
 Spindle
 Spliced
 Splines
 Spongy Pedal
 Spool Valve
 Sprag Clutch
 Spring Seat
 Stabilizer Bar
 Stabilizer Mount
 Static Balance
 Static Pressure (Brakes)
 Stator
 Steering Axis Inclination
 Steering Gear
 Steering Gear Sector Shaft
 Strobe Light
 Strut Rod Bearing
 STV (Suction Throttle Valve)
 Sun Gear (Transmission)
 Sway Bar
 Synchromesh
 Synchronize

 Tachometer
 Tallow Paste
 Talipipe
 Tandem Axle
 Tandem Suspensions
 Taper
 Tapered Gauge
 TCS (Transmission Controlled
 Spark)
 TDC (Top Dead Center)
 Thermal Distributor
 Vacuum Valves
 Thermo Expansion Valve
 Thermostat
 Thrust Bearing
 Tie Rod
 Tie Rod Sleeves
 Timing Sprocket and Chain

Toe-In
 Toe-Out
 Tolerance
 Torque
 Torque Converter
 Torque Wrench
 Torsion Bar
 Torsional Vibration
 Tram Gauge
 Transaxle
 Transfer Case
 Tread
 TRS (Transmission
 Regulated Spark)
 Turbine
 Turbocharger
 Turning Radius
 TVRS (Television and Radio
 Suppressor)
 TVS (Thermostatic Vacuum Switch)
 Twin Cam Chamber
 Twin Countershaft Gearbox

 Universal Joint
 Upshift

 Vacuum
 Vacuum Advance
 (Distributor)
 Vacuum Booster
 Valve Cover
 Valve Face
 Valve Float
 Valve Grinding
 Valve Guide
 Valve Head (Engine)
 Valve Lash
 Valve Lifters
 Valve Margin
 Valve Seat
 Valve Seat Grinding
 Valve Spring
 Valve Stem (Engine)
 Valve Tappet
 Valve Timing
 Vapor Lock
 Varnish (Fuel Residue)
 Venturi
 Vibration Damper
 Viscosity
 Voltage
 Voltage Drop
 Voltage Regulator
 Voltmeter

 Wander (steering)
 Watt Draw Test
 Wheel Bearing Backlash
 Woodruff Key
 Wrist Pin

 Zener Diode

APPENDIX III

JOB DESCRIPTION AND STUDY GUIDE FOR
CERTIFIED AUTOMOBILE AND LIGHT TRUCK MECHANIC

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CERTIFIED AUTOMOBILE & LIGHT TRUCK MECHANIC

JOB DESCRIPTION AND STUDY GUIDE

The Motor Vehicle Service and Repair Act provides for the regulation of the practice of servicing and repairing motor vehicles, and the training and certification of mechanics. Section 12 of the Act says "An applicant shall be required to have passed an examination which is designed to test the ability to correctly diagnose and repair motor vehicles in the category for which the applicant is applying."

This document will help you to:

1. Identify and understand the knowledge and skills in each major repair category.
2. Be familiar with the different types of test questions in the tests.
3. Understand the words and phrases used in technical manual mechanic tests.
4. Locate educational information about the motor vehicle mechanic trade.

I. Basic Knowledge and Skills by Repair Category

The following lists are basic descriptions of what Certified Specialty Mechanics are expected to know and do in most job situations. This list is used as a basis for writing test questions.

A. ENGINE REPAIR

1. Identify and understand all types of engines in motor vehicles.
2. Diagnose the cooling system for problems or leaks and make the required repairs.
3. Remove, replace and adjust fuel, ignition and accessories on the engine.
4. Perform various tests to diagnose the repairs required on an engine.
5. Disassemble an engine.
6. Inspect component parts to determine repairs or parts needed.

7. Perform needed repairs to manufacturer standard and procedure.
8. Assemble repaired or replaced parts of the engine using proper procedures and specifications.
9. Test run engine for proper performance.

B. ENGINE TUNE-UP

1. Identify and understand motor vehicle fuel, ignition, emission control, and related engine systems.
2. Perform engine diagnostic tests to determine the need for repairs or adjustments using electrical instruments and gauges or an electronic engine analyzer.
3. Perform light repairs on engine components other units which are part of the power or drive systems.
4. Perform tests and make any necessary repairs or adjustments on
 - a. Distributors
 - b. Charging system
 - c. Battery
 - d. Starter
 - e. Spark plugs
 - f. Electronic ignition system
5. Perform engine exhaust analysis and know the corrective steps needed to eliminate excess emissions.

C. FRONT END AND STEERING SYSTEMS

1. Identify and understand front end suspension and steering systems.
2. Inspect front end suspension and steering component parts for wear or damage.
3. Replace suspension and steering components using manufacturers specifications.
4. Measure caster, camber and toe-in and determine what corrections are necessary to adjust the front end to within manufacturers specifications.
5. Diagnose tire wear or handling characteristics when recommended front end adjustments do not remove the problem.
6. Perform steering system tests on manual and power assisted steering systems and perform any repairs required.

D. BRAKES & BRAKING SYSTEMS

1. Identify braking system types and understand variations in operation and features, such as warning systems, compensating valve, etc.
2. Diagnose drum and disc braking system problems to determine the repairs needed.
3. Disassemble, clean, inspect and evaluate braking system parts as according to manufacturer standards.
4. Perform brake drum and disc turning operations to proper size and finish.
5. Assemble brake system component parts and assemblies to manufacturer specifications.
6. Perform braking system operation tests and road test vehicle.

E. AUTOMATIC TRANSMISSION

1. Understand the operational principles of automatic transmissions in automobile and light trucks.
2. Diagnose automatic transmission problems by road testing and analysis of driver complaints.
3. Make exterior checks and adjustments which may be done without removing the automatic transmission from the vehicle.
4. Perform control and operating pressure tests and stall test (if recommended by the manufacturer) to aid in the diagnosis of improper operation of the automatic transmission.
5. Perform major and minor overhaul of popular automatic transmissions as determined by diagnosis.
6. Check the transmission for proper operation and road test.

F. MANUAL TRANSMISSIONS

1. Identify and understand the operation of manual transmission and clutches.
2. Diagnose clutch problems based on road test or customer complaint and make the repairs needed.
3. Diagnose manual 3, 4 and 5 speed transmission problems.

4. Remove 3, 4 and 5 speed manual transmissions from the vehicles, disassemble, clean, inspect and measure, replace worn or broken parts and reassemble using manufacturer procedures and specifications.
5. Disassemble, inspect, replace worn or broken parts as needed and reassemble a front axle assembly on a 4-wheel drive vehicle.
6. Diagnose front and rear drive axle operation to determine any problem.
7. Repair as necessary and adjust the parts of the final drive assembly using manufacturer recommended procedures and specifications.
8. Perform diagnosis and repair common to special drive line axle units such as full floating rear axles, locking hubs, etc., using manufacturer procedures and specifications.
9. Perform driveshaft angularity checks using manufacturer specifications and procedures to make the indicated corrections.
10. Remove, inspect and replace standard cross and roller universal joints and/or constant velocity joints.
11. Diagnose unbalanced and out-of-round drive shaft problems and make needed repairs.
12. Diagnose and repair related suspension components and assemblies.

G. ELECTRICAL SYSTEMS

1. Identify and understand electrical circuits and components.
2. Test a wiring harness to determine opens or shorts in circuits and make any needed repairs.
3. Perform and interpret results of various starter tests and make repairs needed to return the starter to manufacturer specifications.
4. Diagnose electrical gauges and indicator problems and repair or replace the units.
5. Diagnose charging system failure to determine what repairs will return the system to proper operating condition.
6. Perform specific gravity, cell voltage capacity, and resistance tests to determine the condition of the battery.

7. Diagnose problems in an electronic ignition system and repair as needed using manufacturer specifications and procedures.
8. Diagnose electrical system problems in the heater-air conditioning system controls and make any required repairs.
9. Diagnose, repair or replace, and adjust wiper motors, cruise controls, window control motors, power antennas, etc., using manufacturer specifications and procedures.

H. HEATING & AIR CONDITIONING

1. Identify and understand the operation of the various types and designs of automobile heating and air conditioning systems.
2. Diagnose manually controlled air conditioning-heating system problems and make the necessary repairs or adjustments.
3. Diagnose automatic temperature controlled heating-air conditioning systems and make repairs, adjustment and/or replacement of parts as indicated.
4. Diagnose and repair heater leaks and low heating performance using manufacturer recommended procedures.
5. Perform air conditioning system "tune-up" or periodic check using manufacturer recommended procedures and specifications.
6. Diagnose the need for and perform an evacuation of an air conditioning system and recharge to the correct capacity.
7. Perform various air conditioning system repairs which require "opening up" of the system using manufacturer recommendations and safe practices.
8. Leak test an air conditioning system using a liquid leak detector, propane torch type leak detector, or electronic type leak detector.

II. Sample Test Questions

The following sample test questions are intended to introduce the style of questions used in Michigan Department of State Competency tests. The samples in no way represent content of the actual tests. The intent is to increase your awareness of test technique and key words or statements which the question is designed to test. Each style of question you are likely to find on the actual test is represented here.

1. There is no free play in the clutch pedal. The likely cause of this problem is:
 - A. Warped clutch disc.
 - B. Worn release fingers.
 - C. Worn clutch facing.
 - D. Worn input shaft.

2. Constant engine misfiring can be caused by all of the following problems except:
 - A. Leaky exhaust valve.
 - B. Leaky intake valve.
 - C. Leaky head gasket.
 - D. Leaky advance diaphragm.

3. A car leads or drifts to the left while driving on a straight, level road. The likely cause of this problem is:
 - A. Too much positive camber on front wheels.
 - B. Tires are not the same size.
 - C. Steering wheel off-center.
 - D. All of the above.

4. Rough idle and poor high speed performance could both be caused by:
 - A. Dirty fuel filters.
 - B. A burned exhaust valve.
 - C. A leaky air horn gasket.
 - D. Late spark timing.

5. Low main line pressure in an automatic transmission can cause:

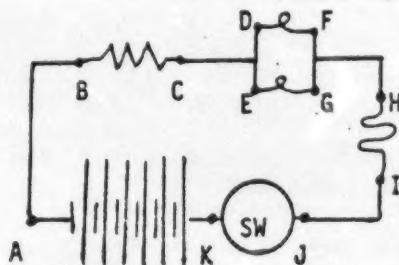
A. Burned smelling transmission fluid.
B. Slipping transmission under load.
C. Harsh up-shifts.
D. Both A and B above.

6. The engine continues to run, knocking noisily, for several seconds after the key is turned to the "off" position. The likely cause of this problem is:

A. Idle speed set too high.
B. Short in coil primary circuit.
C. Faulty catalytic converter.
D. Idle mixture is too rich.

7. In the circuit shown below, where would you place voltmeter leads to measure voltage drop in the light circuit?

A. A & B.
B. D & E.
C. C & H.
D. A & K.



8. A cycling clutch A/C system has been overcharged with R12. Which of these will likely happen as a result of overcharging?

A. Cooling will be excessive.
B. The compressor valves will stick.
C. Moisture will be forced into the R12.
D. None of the above.

9. All these kinds of disc brake calipers have been commonly used except:

- A. Floating.
- B. Vented.
- C. Sliding.
- D. Four-piston.

10. The vacuum unit on the distributor advances the ignition timing most under what conditions?

- A. Cruising.
- B. Wide open throttle.
- C. Idling.
- D. Decelerating.

ANSWER KEY:

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1. C; 2. D; 3. B; 4. B; 5. D; 6. A; 7. C; 8. D; 9. B; 10. A.

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